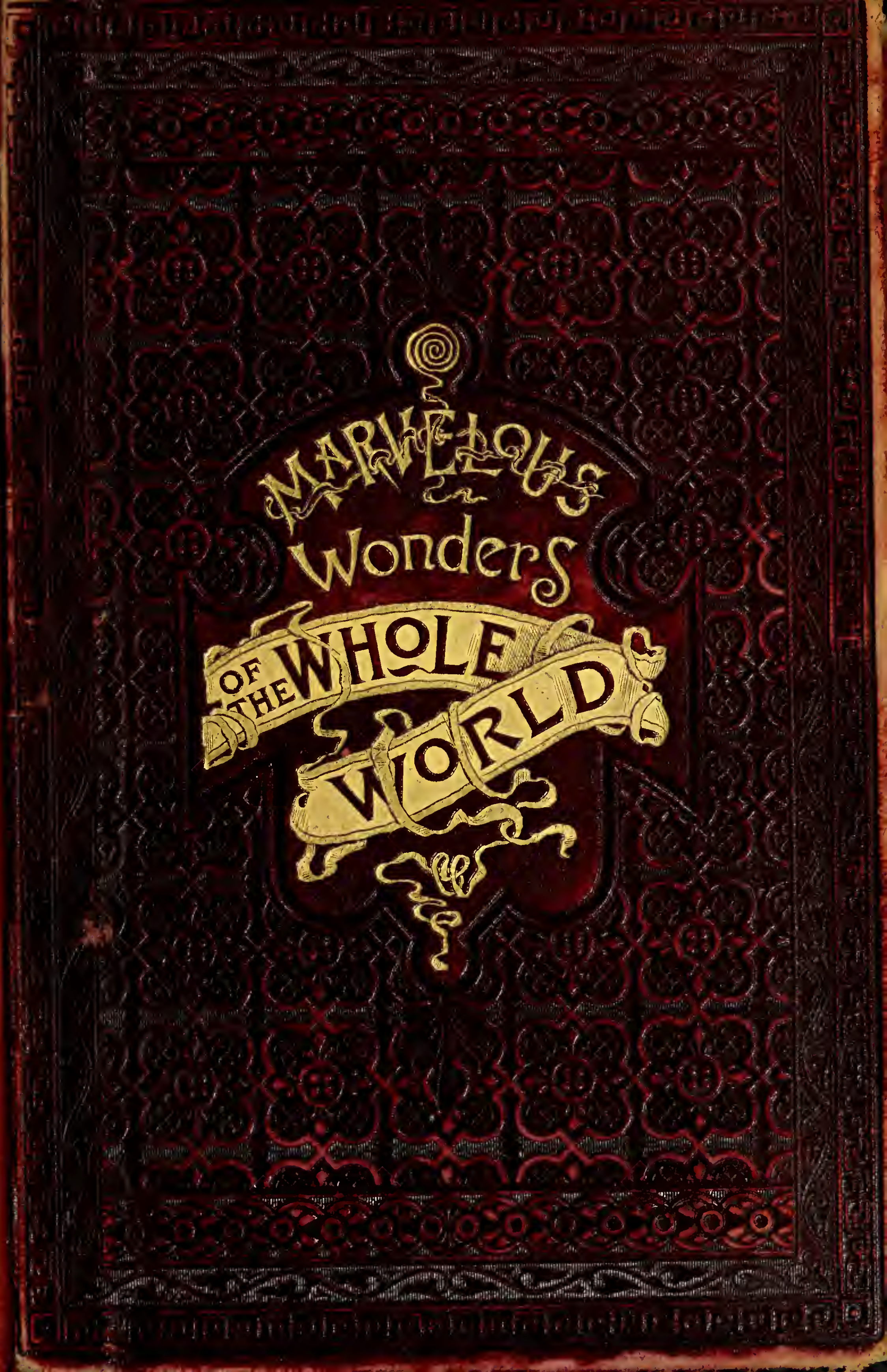

MARVELOUS Wonders OF THE WHOLE WORLD

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MARVELOUS
Wonders of the Whole World

BEING AN ACCOUNT OF

THRILLING ADVENTURES, FAMOUS SIGHTS, CELEBRATED
VOYAGES, AND RENOWNED EXPLORATIONS AND
DISCOVERIES IN ALL PARTS OF THE GLOBE

CONTAINING

Wonders of the Dark Continent; the Land of the Pyramids;
the Flowery Kingdom of the Celestials; the Ancient
Empire of the Mikado; the Sea-Girt
Isles of the Pacific, etc.

AND INCLUDING

THE DISCOVERIES OF LIVINGSTONE, STANLEY, BAKER, SPEKE, DU CHAILLU, AND
OTHER RENOWNED TRAVELERS IN THE TROPICS; THE EXPLORATIONS OF
FRANKLIN, KANE, GREELY, AND OTHER FAMOUS NAVIGATORS IN
THE POLAR REGIONS, WITH WORLD-RENOWNED SCENES
AND OBJECTS OF INTEREST IN ALL LANDS;

TO WHICH IS ADDED

A FULL AND GRAPHIC DESCRIPTION OF THE WONDERS OF THE OCEAN AND OF
THE ATMOSPHERE; THE WONDERS OF ANIMAL, INSECT AND VEGETABLE
LIFE; THE WONDERS OF ASTRONOMY, GEOLOGY, LIGHT,
HEAT, ELECTRICITY, ETC., ETC.

THE WHOLE COMPRISING A
Vast Museum of all that is Marvelous and Wonderful
IN THE EARTH, SEA, AIR, AND SKIES.

CAREFULLY EDITED BY

HENRY DAVENPORT NORTHROP, D. D.,

THE WELL-KNOWN AUTHOR.

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the lives of Livingstone, Stanley, and other Great Explorers, and
with Illustrations of the most Remarkable Objects in
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PREFACE.

There was a time when men spoke of the Seven Wonders of the World, and these were celebrated in the finest productions of prose and poetry. That time has long since passed, and the number seven would now have to be multiplied many fold to enumerate the marvels of the globe. To set these forth in attractive form is the object of the present volume.

As might be expected, therefore, the book is very comprehensive. The first part is occupied with wonders brought to light by explorations in many countries. Almost every land beneath the sun presents us with something of thrilling interest. In all parts of the globe we have but to lift the veil of mystery to meet with revelations which excite our astonishment. In this book the reader is made the traveler. He is transported from clime to clime, from country to country, and, through artistic illustrations and picturesque descriptions, becomes acquainted with the marvelous. He is conducted through the Dark Continent, the Land of the Pyramids, the Empires of China and Japan, the sea-girt isles of the Pacific, the icy regions of the Poles, the renowned countries of North and South America, and while the scene changes at every step, the wonders never cease. A book of mere commonplaces would have little interest for the general reader. The aim has been to make this volume true to its title. To realize that aim, the records of research and discovery have yielded their most valuable treasures.

While the world's knowledge has been enriched in recent times through the great achievements of such celebrated explorers as Livingstone, Stanley, Du Chaillu and others in the Tropics, and Franklin, Kane, Greely and their compeers in the Polar realm, it is also true that new names have been added to the roll of heroes, and the history of

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their enterprise, their courage, sufferings and successes, forms one of the most thrilling pages in the annals of time. In this book the reader becomes the companion of these heroic souls, and is made a participant in their wonderful adventures and discoveries.

The second part of the book vividly presents the myriad wonders of Natural History, Science, Art, Ethnology, etc. Every Kingdom of Nature is explored and made to disclose its Marvelous Secrets. The Atmosphere contributes its snowy crystals, gorgeous pictures of the sun, cyclones and auroral splendors. The Ocean is fathomed, and whatever of special interest is to be found among its flowery growths, its strange fishes, and buried treasures, is minutely described. Even Subterranean mysteries are lighted by the torch of investigation. The Animal Kingdom is also largely represented, and whatever is curious and interesting in animal life finds here a place. The most attractive specimens of Birds are described, and interesting lessons are drawn from the habits and instincts of the feathered tribes. Under the microscope the Insect World is seen to be an extraordinary part of creation, presenting something to entertain and instruct the reader at every glance.

Special attention has been given to the minute forms of life, for these have the truly marvelous wrapped up in them as well as the planets and star-clusters of Astronomy. The skies contribute their swift comets, meteoric showers, and wonders of infinite space. Some of the most remarkable discoveries of our day, and some of the most ingenious mechanical inventions, have been in connection with Electricity. These are plainly described, without the use of abstruse scientific terms. Light—the swiftest traveler in the universe—illuminates these pages; in fact, no department of science is omitted. Search has been made for the Wonderful in every nook and corner of the globe.

Special pains have been taken with the engravings which accompany the book; and these, by their great variety and artistic merit, form a very striking and valuable feature.

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THE tropics, which were once a realm of mystery, have been made to reveal their startling wonders. No part of the globe in our day can remain shrouded in darkness. Travelers who were not to be turned back by the greatest dangers and hardships, have explored the polar regions, and penetrated to the very heart of Africa. By their discoveries, which have attracted the attention and excited the interest of the whole civilized world, they have made known to us marvelous regions, of which we had heard, but with which we were almost as little acquainted as we are with the depths of the sea. Great wonders have been revealed.

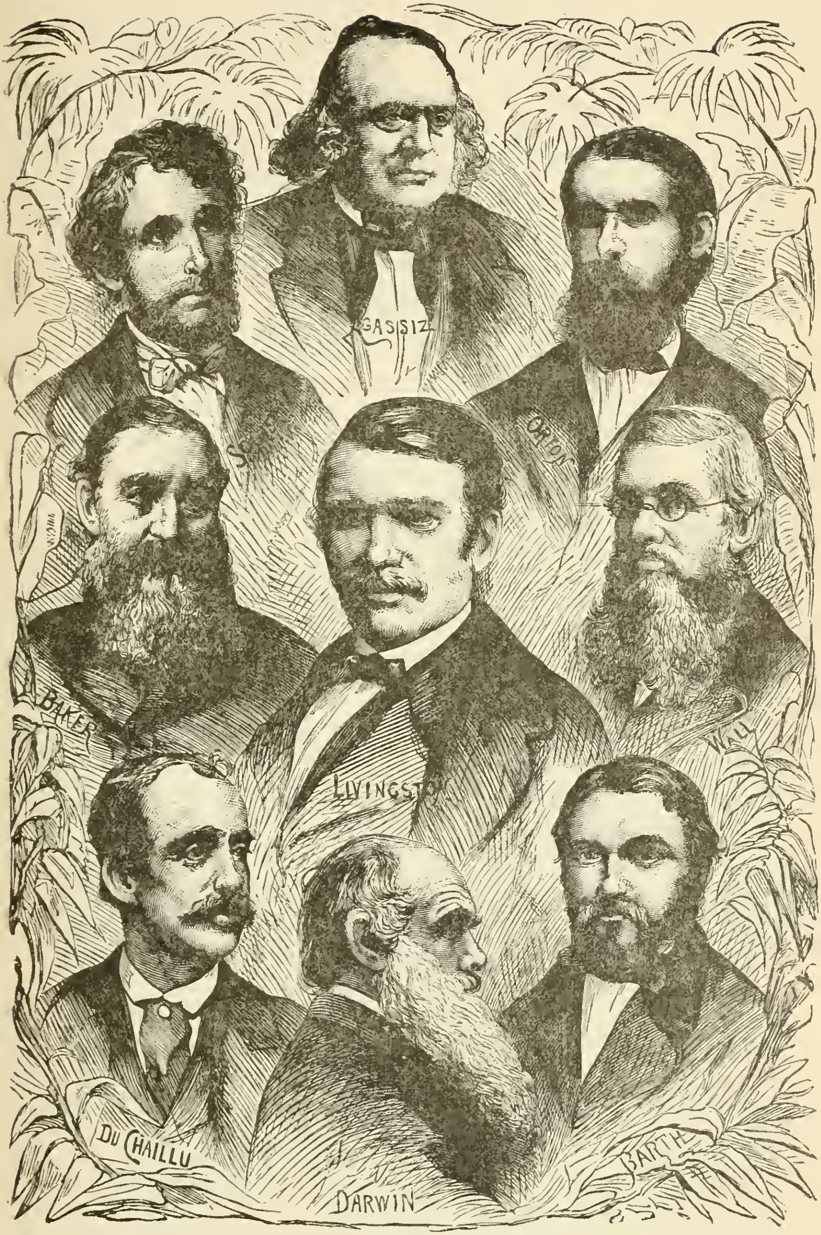
One of the best known and most illustrious of modern travelers in Africa was Dr. Livingstone. His adventures read like the story of the Arabian Nights. They have increased our geographical knowledge, opened up the portions of the great African continent before unknown to the world, and made a pathway for the spread of civilization and Christianity. His coolness and presence of mind in danger, his courage and power of endurance; the tact, kindness and firmness exhibited in his intercourse with friendly or hostile natives, have made his name revered and honored, and gained for him a place in the affections of the benighted people of Africa, such as no traveler ever before won.

Little did the "factory hands" at the old Blantyre Cotton Works, standing on the banks of the river Clyde just above Glasgow, ever imagine that the quiet, industrious lad called "Davie," working in their midst, would one day attain to world-wide fame, and find a final resting place among the illustrious dead of his country: but such indeed was to be his destiny.

At the age of ten, Livingstone commenced to work as "piecer"; his hours of labor were long, beginning at six in the morning and lasting till eight in the evening, and one would suppose left little time for self-improvement; but the desire for knowledge was strong in the lad, and he employed hours that should have been devoted to sleep to the acquiring of useful information. With part of his first week's wages he purchased a book, "The Rudiments of Latin," and, with the steady earnestness which characterized all his actions, commenced the study of that language. At work, his studies were not neglected. Placing his book on the "spinning jenny," he would read sentence after sentence as he passed to and fro, and so imprint them on his memory as never to forget them. The noise, stir and bustle in the mill never apparently disturbed him; for he had the power of abstracting and concentrating his thoughts so as to be indifferent to what was going on around.

When Davie attained to the high dignity of "cotton spinner" he found the labor severe, but endured it willingly, as he earned good money; by carefully saving which he was enabled during the winter months to attend the Greek, divinity, and medical classes at the Glasgow University. His home training had been deeply religious, and as he grew older his religious convictions strengthened and deepened; so that it is no wonder he resolved to become a missionary to the heathen, and devote life and energies to the welfare of those who sat in the darkness of ignorance and superstition. With this object, in the year 1838, he presented himself for examination before the directors of the London Missionary Society; by them he was approved and sent to the training college at Chipping Ongar, in Essex. In 1840 he left England for Cape Town.

The station to which the young missionary was appointed was that founded thirty years before by Messrs. Hamilton and Moffat, called Kuruman, or Lattakoo, and was about seven hundred miles inland from Cape Town. A long and toilsome journey was necessary before reaching it, through tangled forests, over desolate and barren wastes, rugged hills, and rocky ravines, beneath the burning tropical sun, and surrounded by fierce and savage beasts of prey; but at the end a sight met the traveler which amply repaid all privation and danger. There stood the mission-house surrounded by its neatly-kept garden, stocked with fruits and vegetables; there stood the church, solidly built of stone, and the cottages and huts of the natives, while over all reigned an air of peace and contentment. This is what the labors of the devoted missionaries had effected during the years they had been exiles from their own native land.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THE FAMOUS EXPLORERS OF THE WORLD.

After a short stay at Lattakoo, Livingstone pushed farther into the wilds of the African continent, with the object of founding a new mission station. He went northward as far as the country of the Bachuena or Bakwains, a section of the great Bechuana nation. Settling at a spot called Lepelole, so called after a cavern of that name, he devoted some time to studying the native language, and then made a journey still farther northward to the Bakáa Mountains. Only one European, a trader, had ever before penetrated so far; and when it was understood that Livingstone meant to undertake the journey on foot, the natives laughed at him.

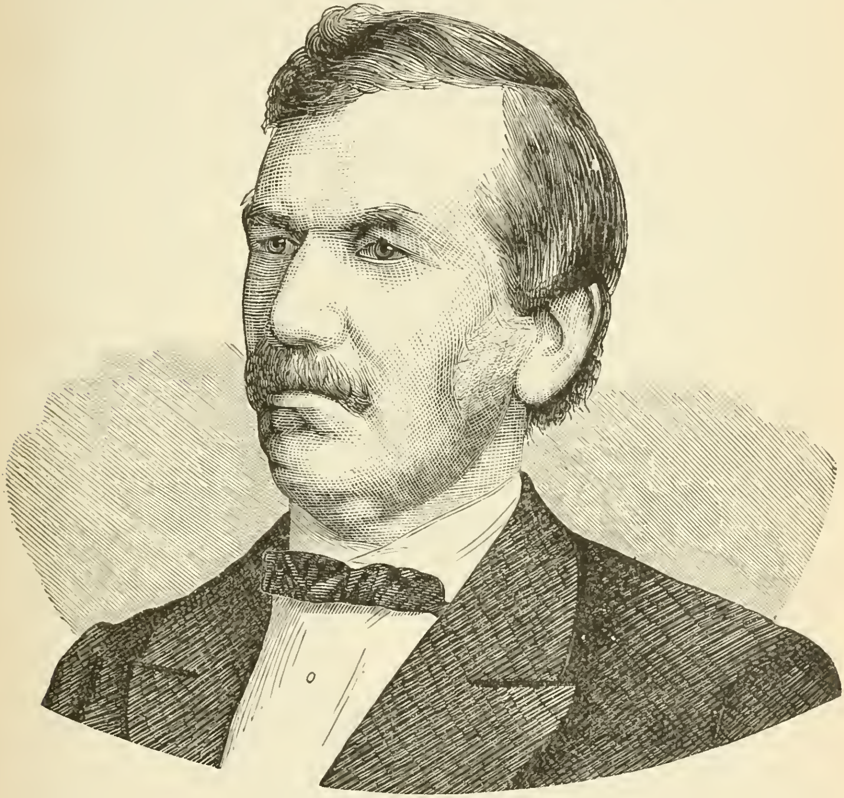
Livingstone was a man of undoubted courage, and during his adventurous life gave many proofs of intrepidity in times of danger. On one occasion, a party of natives were traveling with an ox-wagon about ten miles from his house, when a rhinoceros charged into their midst, inflicting a severe injury upon the driver. A messenger was immediately sent for the missionary, who, in spite of the remonstrances of his friends, mounted his horse, and, in the darkness of the night, rode in all haste to the scene of the accident. But the wounded man was dead, and there was nothing to be done but to ride back again through the forest, risking attacks from the fierce animals, whose cries could be heard on every side.

The Bakatla tribe was troubled by lions, who at night leaped into the cattle-pens, and even by day would sometimes attack the herds. Great was the consternation of the natives, who firmly believed that a neighboring tribe had given them into the power of these merciless animals. Their attacks upon them were feeble and half-hearted, so that hitherto the lions had come off victors. Livingstone now came to their aid, and the cry was—

"Mount! mount for the hunting! the lion is near!
The cattle and herdsmen are quaking with fear.
Call the dogs! light the torches! away to the glen!
If needs be, we'll beard the fierce brute in his den."

They discovered their game on a small tree-covered hill. The circle of hunters, at first loosely formed around the spot, gradually closed up, and became compact as they advanced toward it. Mebalwe, a native schoolmaster, who was with Livingstone, seeing one of the lions sitting on a piece of rock within the ring, fired but missed him, the ball striking the rock by the feet of the animal, which, biting first at the spot struck, bounded away, broke through the circle, and escaped, the natives not having the courage to stand close and spear him in the attempt, as they should have done. The circle re-formed, having yet within it two other lions, at which the pieces could not be fired, lest some of the men on the opposite side should be hit. Again there was a bound and a roar, and yet again; and the natives scattered and fled, while the lions went forth free to continue their devastations.

But they did not seem to have retreated far, for as the party was going round the end of a hill on their way home to the village, there was one of the lordly brutes sitting upon a piece of rock, as though he had purposely planted himself there to enjoy their defeat, and wish them "Good-day." It was about thirty yards from Livingstone, who, raising his gun, fired both barrels into the little bush, behind which the creature was crouching. "He is shot! He is shot!" is the joyful cry, and the people are about to rush in; but their friend warns them, for he sees the tail raised in anger. He is just in the act of ramming down his bullets for another fire, when he hears a shout of terror, and sees the lion in the act of springing on him. He is conscious only of a

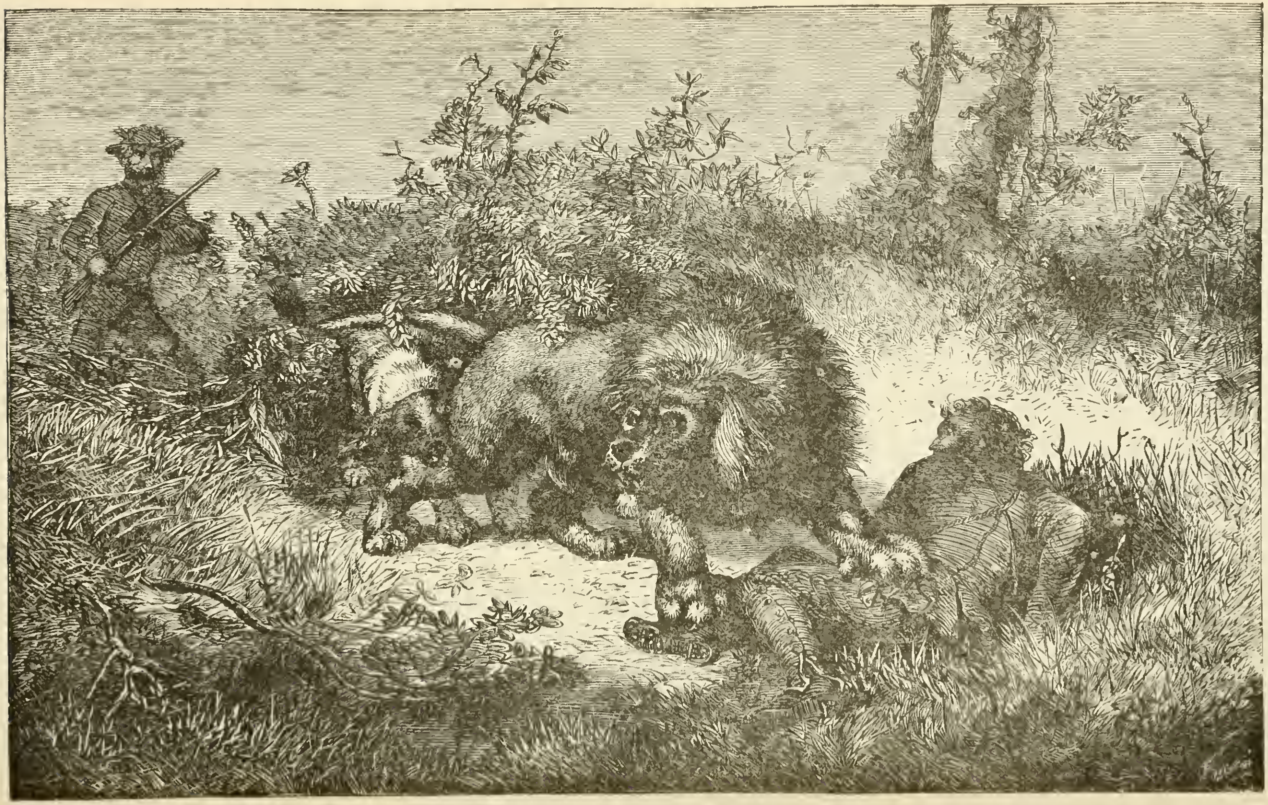


DR. DAVID LIVINGSTONE.

blow that makes him reel and fall to the ground, of two glaring eyes, and hot breath upon his face; a momentary anguish, as he is seized by his shoulder, and shaken as a rat by a terrier; then comes a stupor, which was afterward described as a sort of drowsiness, in which there was no sense of pain nor feeling of terror, although there was a perfect consciousness of all that was happening.

Being thus conscious, as one in a trance might be, Livingstone knew that the lion had one paw on him, and, turning round to relieve himself of the pressure, he saw his companion at a distance of ten or fifteen yards aiming his gun. All this occurred in a few moments; the death-blow had been inflicted by Livingstone before the lion sprang upon him in the blind fury of his dying efforts. No less than eleven of his teeth had penetrated the flesh of his assailant's arm, and crushed the bone; it was long ere the wound was healed, and all through life the intrepid missionary bore the marks of this deadly encounter, and felt its effects in the injured limb. The tartan jacket which he had on, wiped, as he believed, the virus from the lion's teeth, and so preserved him from much after-suffering, such as was experienced by the others who were bitten and had not this protection.

It was from Kolobeng that Livingstone started, in the year 1849, with two white companions, Colonel Steele and Mr. Oswell, to cross the great Kalahari Desert, for the purpose of ascertaining the exact position of Lake Ngami. A long and toilsome journey it proved. Sekómi, chief of the Bamangwáto, through whose lands they were compelled to pass, would give them no assistance; he was afraid, he said, of incurring the enmity of the Makololo, but really because he did not wish the white man to know how prolific the lake country was in ivory. In spite of this, however, the travelers set out, undaunted by the perils which awaited them. Their way lay through a flat sandy country, open forests, bush and grass lands; and then came a soil of soft white sand, into which the wheels sunk so deep that the wearied oxen found it difficult work to move the wagons. Water became scarce, while the fierce beams of the sun poured down on the sand, burning the feet if they rested too long in one place. Thirst was felt by all. In vain the eye roved over the barren waste in search of water; nothing rewarded the effort, and the weary travelers toiled on, with parched tongue aud hanging heads, feeling life to be indeed an irksome burden. Search was made for the *leroshua*, a small plant with long narrow leaves, and a stalk not thicker than a crow's quill, but at the root of which is a tuber as large as an infant's head, and filled with a pulpy mass of cellular tissue containing a sweet fluid delightfully cool and refreshing. Sometimes the search was rewarded



LIVINGSTONE'S ADVENTURE WITH A LION.

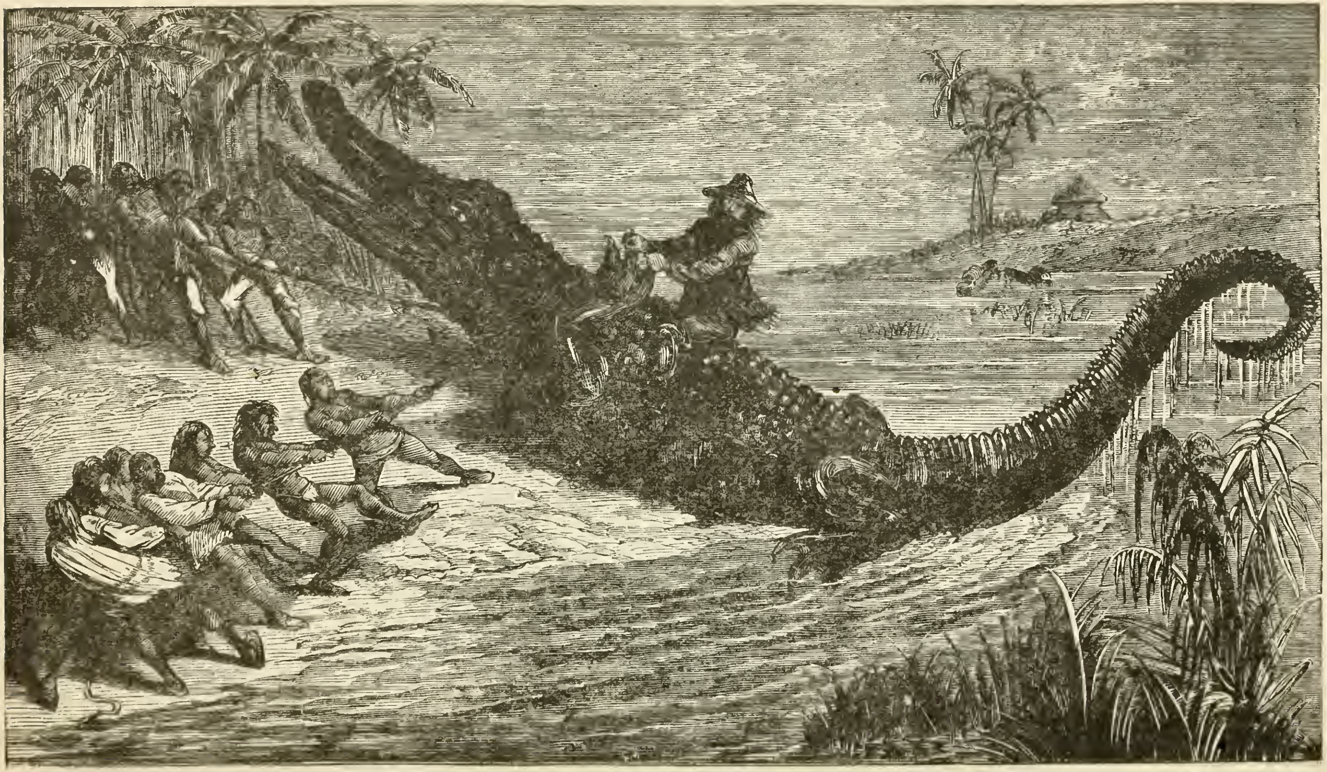
by finding the *kengwe*, or water-melon, which proves equally welcome and refreshing. Whole tracts of the desert, in certain parts, are covered with this plant, to which wild animals of all kinds resort, to enjoy a repast of juicy richness which the absence of water makes doubly precious.

There are a few human inhabitants in this desert, the most degraded of all African tribes, who burrow in the sand or hide in holes of the rocks, or in wretched huts made of grass and vegetable fibres. These are called Bosjemen, or Bushmen, being small of stature, and finding a precarious subsistence in the carcases, often putrid, of animals which die, in insects, roots, or anything that can be eaten. Their language, if such it can be called, consists of a series of uncouth sounds: a strange, wild people, apparently more akin to the fierce animals which surround them than to human beings.

After two months of this weary traveling Livingstone arrived on the banks of a large and beautiful river, running northeast, and natives dwelling there informed him that it flows from the great lake, and is called the Zouga; and shortly after his eyes were gladdened by the sight of the broad and unbroken expanse of the waters of Lake Ngami.

The people dwelling about this lake called themselves Bayeiys, or "men," but their enemies called them Bakoba, or slaves, because they will not fight. They received the travelers with great friendliness, and answered, as far as they were able, all the questions put to them. Several large rivers had been observed flowing into the lake, which, they said, came from a country full of rivers, and full also of large trees. There lived the warlike Makololo natives—ruled over by a great chief named Sebituane—whom Livingstone greatly desired to visit; but the difficulties in the way were too many for him to surmount at this time, and he was compelled to return to Kolobeng.

In the following year he again set forth, with the purpose of penetrating as far as the Makololo people. This time he was accompanied by his wife and three of his children. In this journey he kept more to the eastward, crossing the Zouga at its lowest extremity. But difficulties again prevented him accomplishing his purpose. He lost many of his oxen, which fell into pits dug to entrap wild animals; then he found he was approaching a part of the country where the dreaded tsetse abounded: "a poisonous fly which stings the cattle so that they lose all power of exertion, become emaciated, and soon die; it abounds chiefly on the banks of rivers, and in most marshy places." Once again did our traveler retrace his steps back to his station, his intentions frustrated.



CAPTURING AN IMMENSE CROCODILE.

But the great chief of the Makololo, Sebituane, having heard of Livingstone's attempts to reach him, sent presents of cows to various chiefs, desiring they would do all they could to aid the missionary in his journey to his country. Encouraged by the evident desire manifested by Sebituane that the white man should visit him, our traveler, for the third time, set out, again taking with him his wife and children. And now he was successful. Crossing the Zouga, he soon reached the banks of the Chobe, and in a canoe floated down to the temporary residence of the Makololo chief, who had himself traveled more than one hundred miles to give the missionary a welcome.

This celebrated chief was found by Livingstone encamped upon an island, his principal men seated around him ; as the visitor approached a song of welcome was raised. Sebituane received the traveler with every mark of friendliness, promised him cattle to replace those lost by the tsetse fly, and said he would show him his country, that he might select a spot on which to settle. Meantime, an ox and a jar of honey were presented to him, to supply his immediate wants.

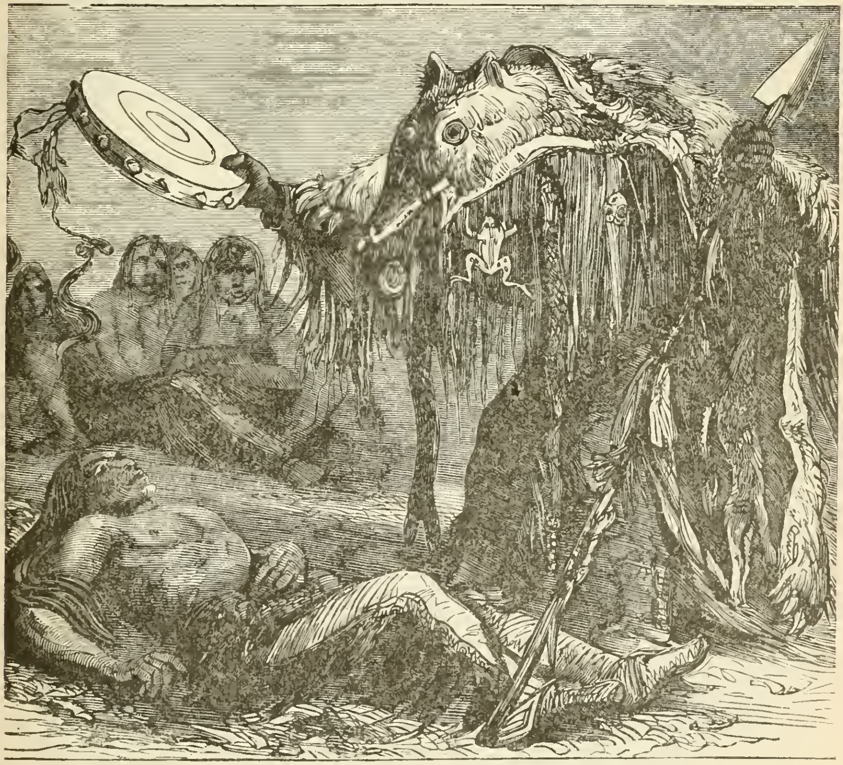
Sebituane had acquired great fame as a powerful warrior, always himself leading his men to battle. He never forgave one that fled from the fight, but on reaching home would order him to be brought into his presence, and would then quietly tell him that as he preferred dying at home to being slain in battle he might do so, and the man was led to immediate execution. His life had been one of varied fortune, for he had fought his way from Kuruman to the Makololo country, where he succeeded in conquering all the various tribes of that vast region, and reigning as sole monarch. He had long wished to have white men settle in his country, to make himself and his people more powerful ; and now, just as his wish was about to be gratified, he fell sick with inflammation of the lungs, brought on by an old wound received in one of his many battles. His sickness proved fatal. Seeing that death was likely soon to ensue, Livingstone wisely refrained from using his own skill on the dying man's behalf, fearing lest his death should be attributed to him.

But, with his son Robert, he paid the dying Sebituane a visit. He found the native doctors gathered around him, hopeful that their enchantments would successfully ward off the fatal blow.

"Come near," said the dying chief to the missionary, "and see if I am any longer a man ; I am done!"

Livingstone spoke of the hope after death, but was interrupted by the doctors exclaiming, "Sebituane cannot die ; speak not of death to him."

The white man stood silently looking on, when the chief noticed that he held his little boy by the hand. He had been pleased with the child, and now, fixing his eyes kindly upon him, said faintly, "Take Robert to Maunku (one of his wives), and tell her to give him some milk." These were the great chief's last words; shortly after he died. "Never," says Livingstone, "was I so much grieved by the loss of a black man before; and it was impossible not to follow him in thought into the other world, and to realize somewhat of the feelings of those who pray for the dead." The remains of Sebituane were buried in the cattle-pen, and over and around the spot the cattle were driven for several hours, that no distinguishing mark should be left to tell where the great warrior reposed, and that no indignity should be offered to the body.



ENCHANTMENTS OF SEBITUANE'S MEDICINE MAN.

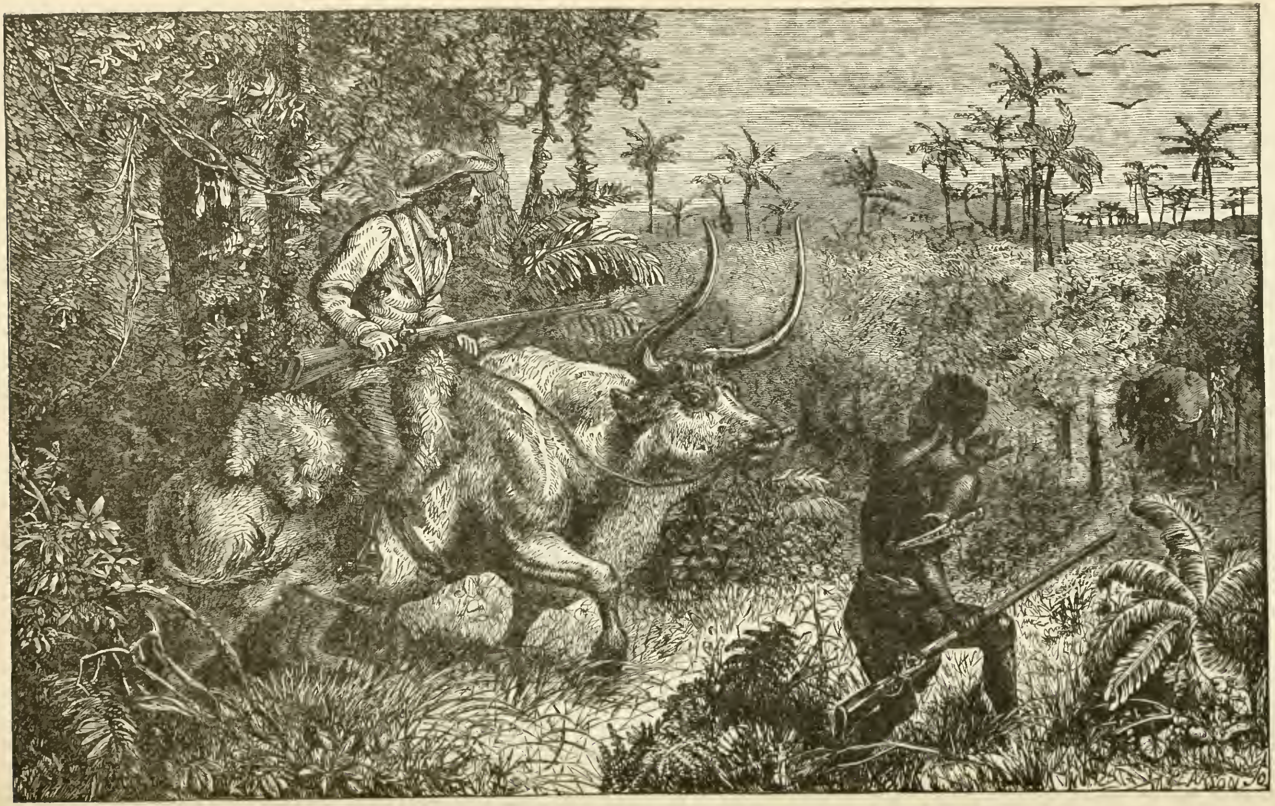
Sebituane was succeeded by his daughter Ma-mochisane, who gave Livingstone permission to visit any part of the country he chose—a privilege of which he was not slow to avail himself; and he carried his explorations more than one hundred miles to the northeast, until he discovered that magnificent river which will ever be associated with his name, the Zambesi. When he first saw its waters it was in the dry season, but even then its breadth at that particular spot was from three to six hundred yards. It rises annually thirty feet of perpendicular height, and floods fifteen or twenty miles of land adjacent to its banks. At such times the whole basin through which it flows has the appearance of a vast lake, the towns and villages—which are built on the spots which rise here and there above the surrounding level—standing out like islands. On these little hills, and amid the swampy tracts between them, live the Makololo, secured by the nature of the ground from the attacks of enemies, against whom, in the higher and more healthy districts, there is no such defense.

The natives spend their time in war, in hunting the elephant and hippopotamus, in fishing, or in shooting the birds which abound in the woods and swamps. Launching their canoes on the broad rivers, they engage in conflict with the dreaded crocodile. At night they gather round the fire, and boast of their gallant exploits.

Upon the women devolve the tillage of the ground, the cultivation of maize and cotton, yams and pumpkins; but the labor required is not heavy, for a great deal is left to nature; the heat and moisture of the ground stimulating the growth, so that they have only to sow and gather.

But in these marshy districts fever proved a deadly foe, especially to strangers; so that Livingstone was fearful if he effected a settlement here it would prove hazardous to the health, if not the lives, of his wife and family. He therefore conveyed them to Cape Town, that they might embark for England, while he himself turned his back on friends and civilization, and once more plunged into the depths of the untrodden African wilds.

When Livingstone again saw the waters of the Chobe it was at the time of its annual overflow. The whole country round was flooded, so that it was impossible to find a pathway through the watery wilderness for his wagons. Many of his men were down with fever, the destructive tsetse fly had destroyed several of his oxen, and his Bushmen guides had deserted him. Leaving his goods behind, he launched his canoe, and with but one follower endeavored to strike the main channel of the river, and so make his way to the Makololo chief's residence. It proved an adventure of no small danger, and the difficulties he had to surmount would have daunted a less resolute man. Frequently he found himself compelled to wade along with the water up to his neck; the brambles tore his body, while a serrated kind of grass, whose edges were as keen as that of a razor, cut his



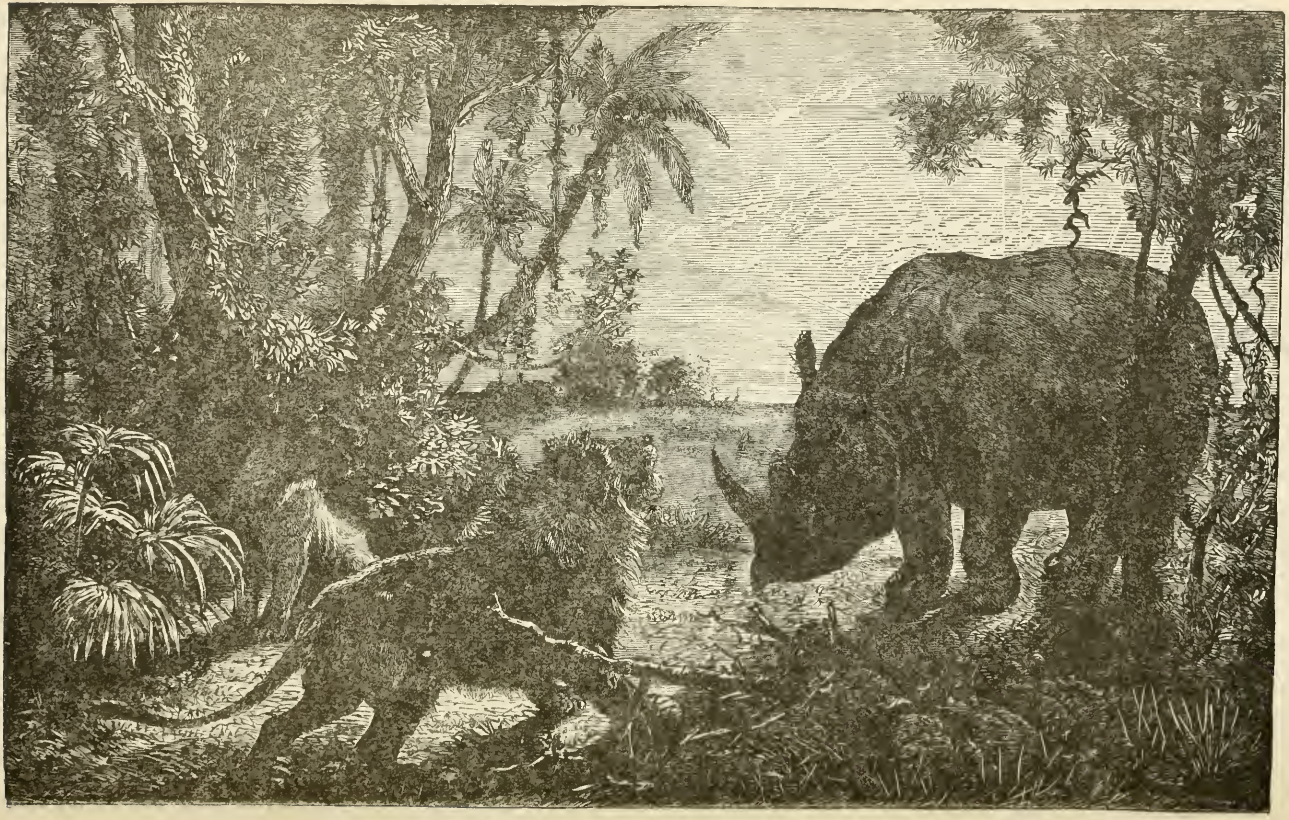
LIVINGSTONE HUNTING ELEPHANTS.

clothes into ribbons. Reaching the village of Moremi, he was there recognized, and the tidings forwarded to the chief, who immediately sent a party to convey him to Linyante, the principal town of the country. The wagons which had been left behind were speedily taken to pieces and lashed to canoes; the oxen were made to swim, while the natives guided them by keeping by their side. All the inhabitants of Linyante turned out to welcome the traveler, and to behold such a wonderful sight as a wagon in motion.

The new chief of Makololo was the son of Livingstone's former friend, Sebituane. The daughter had resigned her power to her brother Sekeletu, who professed a great regard for the missionary. Finding no present prospect of founding a mission station among the Makololo, Livingstone, accompanied by Sekeletu and many under-chiefs, departed from Linyante to make further explorations of the Zambesi river. Never before had he passed through a country so teeming with animal life—countless herds of the graceful antelope, the lion, the elephant, the rhinoceros, rivers with the huge hippopotamus and the scaly alligator, and trees thronged with varieties of the monkey tribe, and birds of all sizes and colors. At every village the cavalcade halts, and the chief is welcomed with shrill cries of "Great lion! mighty chief! sleep, my lord!" while beer and milk in abundance are brought forth to refresh himself, his white friend and his followers.

In November, 1853, Livingstone left the town of Linyante to find his way to the Portuguese settlement of Loanda, on the western coast. A long and toilsome journey it proved. Pathless forests were traversed, through which a road had to be cut with axes; and rivers infested with hippopotami, swimming lazily about, with their enormous snouts just above the water.

These animals are, when not molested, usually harmless, with the exception of the old males, which are expelled from the community and doomed to lead a solitary life. To come upon one of the former class proves dangerous, for it rushes open-mouthed at everything, and has been known to rend a canoe to pieces with its enormous jaws. The crocodile and alligator, which the natives will sometimes attack by diving beneath them and plunging their knives upwards into their bodies, proved only too plentiful on the voyage. Huge trees grew on the very edge of the river's bank, from which gaily-plumaged birds sang to the passing strangers. From the overhanging branches huge lizards were seen basking in the warm sunshine, and as the canoes approached they fell into the water with a splash, to be speared and eaten as a great delicacy by the natives. At the villages on the route they met with a friendly reception, and presents were made of oxen,



NATIVES OF THE JUNGLE.

with the singular saying, "Here is a bit of bread for you." After leaving the noble Zambesi at its confluence with the Leeambye, they pursued their journey up the latter river to the northwest, while the rain poured down upon them for days and weeks in such torrents as can only be seen in a tropical country.

CURIOUS RITES AND CEREMONIES.

Amongst the Kaffir tribes at the villages south of the Zambesi, Livingstone found several very curious rites performed at intervals, but the details were most carefully concealed. Our hero, however, witnessed the dance called "koba," in which a row of naked boys of about fourteen, after answering several questions, such as "Will you herd the cattle well? will you guard the chief well?" were plied with blows from long, thin, and tough wands, wielded by full grown men. Each blow brought blood, and the scars would remain for life. This was supposed to harden the youths, and render them fit for service as soldiers. Another curious ceremony was the so-called "boyale," for drilling young girls for the duties of womanhood, in which the neophytes, clad in dresses of rope made of alternate pumpkin seeds and bits of reed, were made to carry large pots of water under the surveillance of an old hag, often after having bits of burning charcoal applied to the forearm, probably with a view to testing the poor creatures' power of bearing pain. Judging from the manner in which the women discharge their duties this process of discipline is an unhappy failure. It requires more than a savage custom to transform savages, and produce the higher forms of character.

An exhausting journey in a northwesterly direction, was succeeded by a pleasant rest at the Motlatsa wells. With the help of some wanering Bushmen they were able to reach the Chobe. The Sanshureh, a water-course filled by the inundations of the Chobe, long baffled their attempt to cross it, but at last Livingstone and one man got over in a pontoon, and, climbing a high tree, caught sight of the Chobe, which was, however, flanked on both sides by an impenetrable belt of reeds and serrated grass, only to be traversed by bending it down and creeping over it on hands and feet. All difficulties bravely conquered, a Makololo village was entered, and the natives, gathering round our hero, exclaimed, "He has dropped among us from the clouds. We Makololo thought no one could cross the Chobe without our knowledge, but here he drops among us like a bird."

Next day Livingstone returned to his party in a canoe across the flooded land, and was soon joined by some headmen from Linyanti, the capital of Makololo Land, who escorted the party over the river in fine style, swimming and diving amongst the oxen more like alligators than men, and taking the wagons to pieces to carry them across on a number of canoes lashed together.

On the 23d May, 1853, Livingstone entered Linyanti, which he found to be but a very little distance from the furthest point reached in his journey of 1851. The whole population, numbering between six and seven thousand, turned out to gaze at the stranger, and a messenger soon arrived from the reigning chief Sekeletu, son of Sebituane, in whose favor Ma-mochisane had resigned.

An interview with Sekeletu himself soon followed, in which the chief, a mere lad of eighteen, begged Livingstone to tell him what he wished him to do for him; and on the missionary explaining that his aim was to convert him and his people to Christianity, he replied he did not wish to read the Bible, for he was afraid it might change his heart, and make him content with only one wife. He made no objection, however, to his people being taught, and Livingstone held several services, at which the Makololos who attended behaved with surprising decorum and reverence.

WARRIOR ANTS AFTER BATTLE.

Livingstone next made an excursion, with Sekeletu and some one hundred and sixty attendants, to the capital of the Marotse country, crossing a remarkably flat district, dotted with gigantic ant-hills, the work of the ingenious termites, and embarking on the Zambesi.

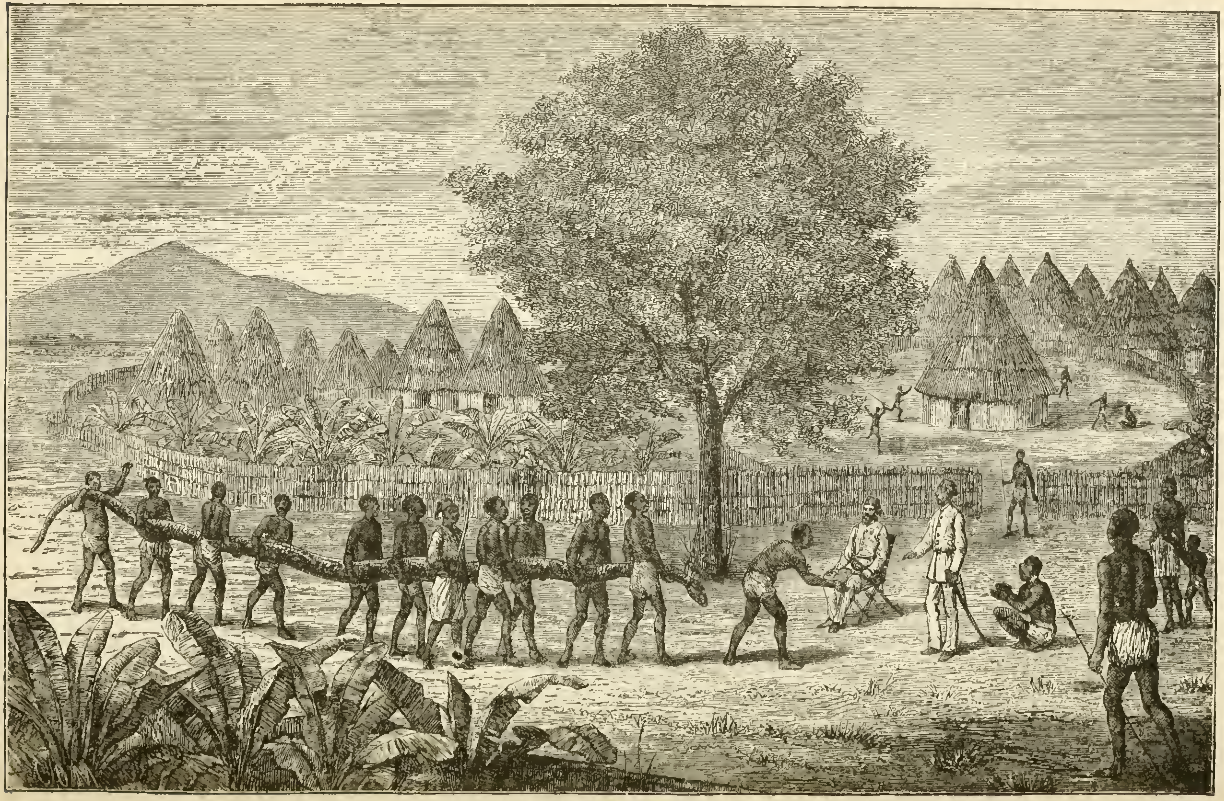
A BEAUTIFUL TROPICAL COUNTRY.

The fleet consisted of thirty-three canoes, of which Livingstone had the best, and Sekeletu the largest. The river, here and there, more than a mile broad, dotted with beautiful islands, wound through a country exceeding in beauty any part of South Africa yet visited by a European. Date palms alternated with palmyras, and every variety of large game, native to the tropical forests of Africa came down to drink, showing no signs of fear at the sight of the canoes. The villages, which were numerous, and inhabited by a people called Banyete, sent out delegates with presents of food and skins for Sekeletu, and Livingstone was able to note at his ease the happy relations existing between the chief and his people. Sekeletu's aim was to govern by moral suasion, proving him to be different from most African chiefs. Soon the tsetse, which alighted even on the canoes, disappeared, and the lofty reedy banks were exchanged for densely-wooded ridges stretching away to the Barotse valley, dotted with villages built on mounds, and resembling in its general character the valley of the Nile. In the Barotse valley itself trees are scarce, though the soil is extremely fertile, supporting large herds of cattle, and is capable of being rendered ten times as productive by judicious cultivation.

Arrived at Nariele, a village built on an artificial mound close to the Zambesi, the course of which is here partially obstructed by a rocky barrier, the party were very heartily received by the Barotse, and great festivities were held in honor of the chief. Before returning to Linyanti, Livingstone walked to the town of Katongo, on the ridge bounding the valley of the Barotse on the north, and found it surrounded by well-cultivated gardens, in which large quantities of maize, millet, yams, sugar-cane, sweet potatoes, etc., were raised. Our hero also ascended the Zambesi for some little further distance, reaching the junction first of the Loeti, and then of the Leeba with the Zambesi, the Loeti flowing apparently from the west north-west, and the Leeba from the north northwest.

Back again in September, 1853, at Linyanti, after this preliminary trip, Livingstone now lost no time in preparing for his great journey to the west, and in November started up the Chobe, escorted by twenty-seven men of different tribes charged by Sekeletu to protect him, and to open up free trade between the Makololo country and the white men of the coast.

The 30th November found the party at the Gouye Falls, where the canoes were carried over the rapids slung on poles, and a few days



BRINGING A HUGE SNAKE INTO CAMP.

later Nariele was again entered. Between it and Libonta, the next stopping-place, Livingstone was delighted by the sight of hundreds of birds, including some thirty different species, such as the speckled and blue and orange kingfishers, the religious ibis, the white pelican, the scissor-bills, the sand-martins, etc. Large black geese were to be seen stalking here and there on the bank.

MARVELOUS ESCAPE FROM AN ALLIGATOR.

In the river savage alligators abounded, at the sight of which Livingstone owns to being unable to repress a shudder, after having seen the narrow escape of one of his men who was dragged down under water by the thigh, but escaped by stabbing his scaly antagonist in the shoulder with a short javelin. The alligator, writhing with pain, left his victim, who swam back to the canoe with the blood gushing from his wounds. The natives are so accustomed to these attacks that they are seldom taken off their guard.

Leaving the Zambesi on the 28th December, the party embarked on the Leeba, and ascended it for some distance, till the Balonda country, the first village of which was governed by a woman named Manenko, was entered, where our hero was rather coldly received, as he was supposed to have profited by the capture of some of the natives as slaves a short time previously. The fact that he brought with him two or three of the victims sent back by Sekeletu, however, produced something of a reaction in his favor, and Manenko promised to visit him, but kept him waiting so long for an interview that he lost patience, and went on without seeing her.

On the 6th January, however, just after the arrival of the party in the village of another female chief, Manenko made her appearance. A tall strapping woman about twenty, with her body smeared all over with a mixture of fat and red ochre, and no clothing but a profusion of ornaments round her neck, her sable highness conducted herself in a very overbearing manner, and announced her intention of accompanying Livingstone to the residence of her uncle Shinté or Kabompo, the greatest Balonda of the country. This intention she carried out, and Livingstone gives a pathetic account of his sufferings in consequence. First she could not be induced to start, and when, after several days' delay, she trusted her precious person on a canoe to cross a little stream, having first had some charms repeated over her by her doctor, she enlivened the journey with perpetual scoldings. Leaving the river, a tract of forest land was traversed beneath heavy rain, Manenko's escort keeping up an unceasing clatter with their weapons.

Disdaining to ride, Manenko trudged along on foot at a pace which few men could equal, and Livingstone, being on ox-back, rode leisurely beside her. Once, bending down to his lady leader, he ventured to inquire why she did not protect herself from the rain with a little clothing, and was answered that it would be effeminate for a chief to do so.

Again and again delayed at Balonda villages by the incessant rain or by Manenko's manœuvres, and as they advanced further north compelled to cut their way with an axe through the dense tropical forests here lining the banks of the Leeba, the party did not reach Shinté's village until the 17th January, but the cordial reception there met with did much to atone for the troubles of the journey.

RECEPTION IN HONOR OF LIVINGSTONE.

Shinté declared himself greatly honored by Livingstone's visit, and gave his guests a reception rivaling in barbaric magnificence any ceremony of the kind yet witnessed by our hero. The "kotla," or place of audience, about a hundred yards square, overlooked by numerous well-built conical-roofed houses, was lined with warriors, including many Mambari, or half-caste Portuguese slave traders from the west. Two trees of the banyan species stood at one end, and beneath one of them sat Shinté, wearing no clothing but some scanty drapery about the loins, and numerous bracelets on his arms and legs. Opposite to him and beneath the second tree Livingstone seated himself on his own camp-stool, his attendants grouping themselves behind him. Filing before their host, Manenko's party saluted him by clapping their hands, and the headmen of Shinté's tribe answered by making obeisance and scattering ashes. Then the soldiers, all armed to the teeth, made a kind of dash at the strangers, which they bore unmoved, and the preliminaries were over. The explorers were highly amused at their singular greeting.

Behind Shinté sat some hundred women, all gorgeous in red baize drapery, and in front was his chief wife, a Matabele woman, distinguished by a curious red cap on her head. All having made their salutations, a good deal of springing, dancing, and so-called music ensued, succeeded by speeches, between each of which the women sang a plaintive ditty. Nine orations were delivered with the greatest decorum, and then Shinté rose as a signal for the breaking up of the meeting. The soldiers discharged their guns, and the company dispersed.

Livingstone was detained some little time in Shinté's town by fever and his host's unwillingness to allow him to depart, but on the 26th February he managed to get off, his escort augmented by six Balonda men to help to carry his luggage. Crossing the southern part of

Loanda, and halting at various villages—at one of which the inhabitants carried their hospitality so far as to hurry to meet him, carrying the roofs of huts for his accommodation on their heads—then fording the river Lotembwa, he entered the town of the great chief Katema, one of the largest yet visited.

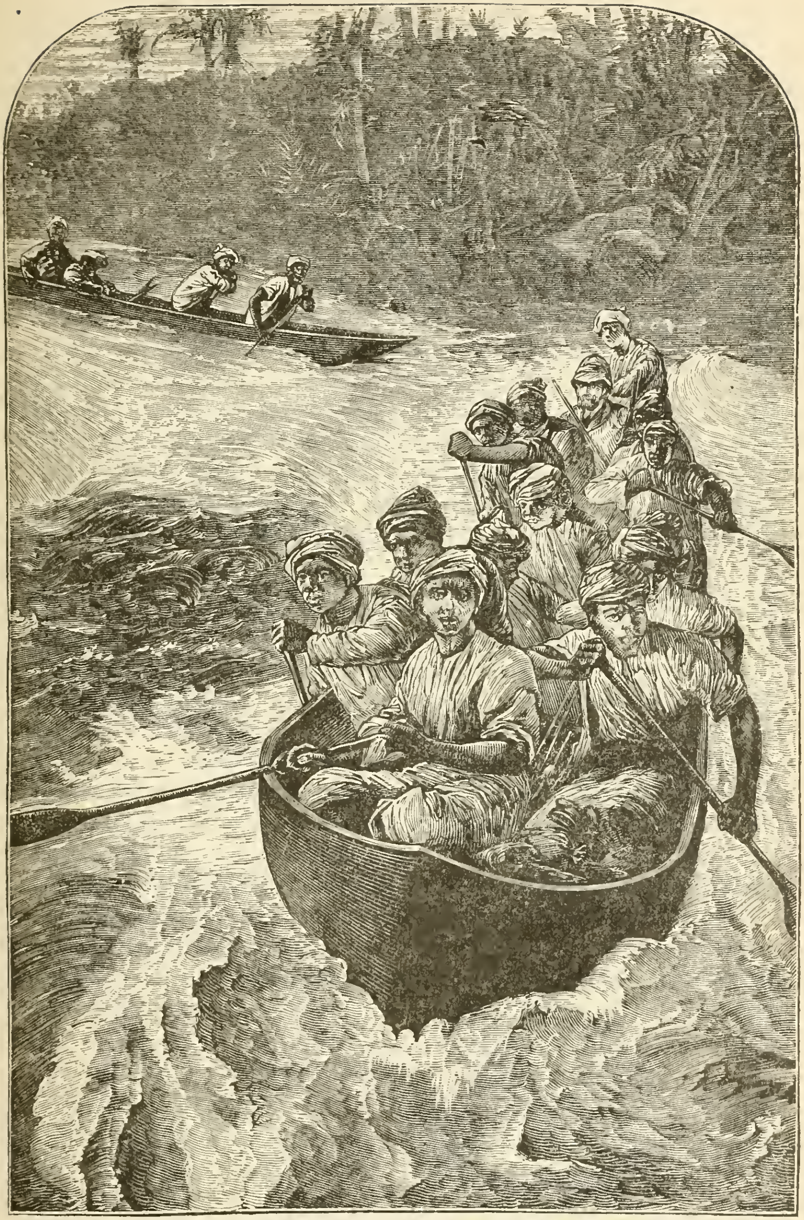
Katema, on Livingstone's arrival, was giving audience, in the presence of some three hundred men and thirty women, to a party of young men who had fled from the neigboring chiefdom of Lobale, on account of its ruler selling their relations for slaves to the Portuguese, a fact significant of the approach to the western coast.

The history of the white man's journey and intentions in coming to the country having been duly stated by an interpreter, Katema bade him welcome, and presented him with sixteen baskets of meat. He also promptly provided three guides to conduct his visitor to the coast, and proved himself in every respect most courteous and friendly. On Livingstone asking him what he would like from Loanda, Katema replied, that everything of the white people would be acceptable, and he would receive anything thankfully, but the coat he had on was old, and he would like another.

THE SAVAGES DEMAND TRIBUTE.

Coming to the valley of the Quango, the Chinji, as the natives of the most easterly portion of the valley were called, made a demand to which Livingstone had now become accustomed, of a man, an ox, or an elephant's tusk for right of passage through their country; and on our hero's assuring their host that his supplies were exhausted, they were anxious that he and his attendants should be killed and his property seized. A personal interview with the chief, Sansawe by name, fortunately somewhat changed the aspect of affairs. Livingstone showed him his hair—always a cause of astonishment to the negroes—his watch, and his compass, and Sansawe went off without exacting the tribute asked for. A little later he sent a message to say that the white man must either give him some pounds of meat and copper rings or return by the way he had come. To this our hero replied simply that he should go on the next day, and his interpreter added of his own accord, "How many white men have you killed in this path?" which meant, "You have never killed any white man, and you will find ours difficult to manage." On more than one occasion it was found that a bold front was the best defense, and any appearance of timidity would have worked disastrous to the whole party, involving serious consequences.

Expecting from this interchange of courtesies to have to cut his way through, Livingstone broke up his camp before daylight the next



SHOOTING THE RAPIDS OF THE LOWER CONGO.

morning, but he was allowed to depart unmolested. His men, who could scarcely believe their good fortune, pressed on cheerfully beneath a heavy downpour of rain, till they were brought to a stand near the Congo, here one hundred and fifty yards wide and very deep, with discolored waters, a peculiarity never noticed in any river of Makololo or Loanda.

Anxious to cross the river as quickly as possible, Livingstone endeavored to obtain canoes from the natives on its banks, but their chief forbade them to lend any without the payment "of a man, an ox, or a gun." Our explorer's blanket was the only article he had left which he could possibly spare, but he was ready to sacrifice it rather than waste any time so near the first Portuguese settlement, where his difficulties would probably end. Doubting alike the honesty and power of the river chief, however, he tried to persuade his men to seize the canoes before he gave up the blanket, but they were afraid of being attacked by the natives. Meanwhile the chief repeated his demands, and Livingstone's men were stripping off their own copper rings in the hopes of satisfying him, when a young, half-caste Portuguese sergeant of militia came up and urged our hero to move on to the bank in spite of chief and people, for he could get the ferryman to take them over the river. Repeatedly did our hero find fortune favoring him as he pressed on through the wilds of this dark country, passing safely through all dangers.

Delighted at this unexpected arrival of succor, Livingstone ordered his men to move on, and under a blaze of ammunition from the natives which did no execution whatever, the party hastened down to the river. Cypriano made a satisfactory arrangement with the ferryman, and Livingstone saved his blanket. As soon as the opposite bank was reached, Negroland may be said to have been left behind, for our hero was in the territory of the Bangala, who are subjects of the Portuguese. Cypriano, who lived near the Congo, invited the whole party to rest at his quarters, and most hospitably entertained them for the next few days, stripping his garden in their service, and slaughtering an ox for their table.

ASTONISHMENT AT FIRST SIGHT OF THE SEA.

The first sight of the sea astonished the Makololo and other servants from the interior beyond all bounds. Awestruck, they whispered to each other that the ancients who said the world had no end were wrong, after all, for here was the end of the world; it was finished; there was no more of it. Should they be kidnapped and carried off by the Portuguese, or perhaps by those mermen of which faint rumors had reached them on their own journey down? One man asked Livingstone if they could watch each other at Loanda: "Suppose one went for water, would the others see if he were kidnapped?" Reassuring the poor fellows as best he could, and promising them that they should incur no danger he did not share, Livingstone prevailed on them to remain in Loanda till he should return with them to Linyanti. Having, in spite of much suffering from fever, fulfilled the main objects of his visit by opening commercial relations between the interior and the Portuguese settlements, Livingstone started on the return journey for Linyanti, laden with presents for Sekeletu and the chiefs who had aided him on the westward trip. The gift for the ruler of Makololo Land was a complete colonel's uniform and a fine horse, to which the merchants of Loanda added handsome specimens of all their articles of trade.

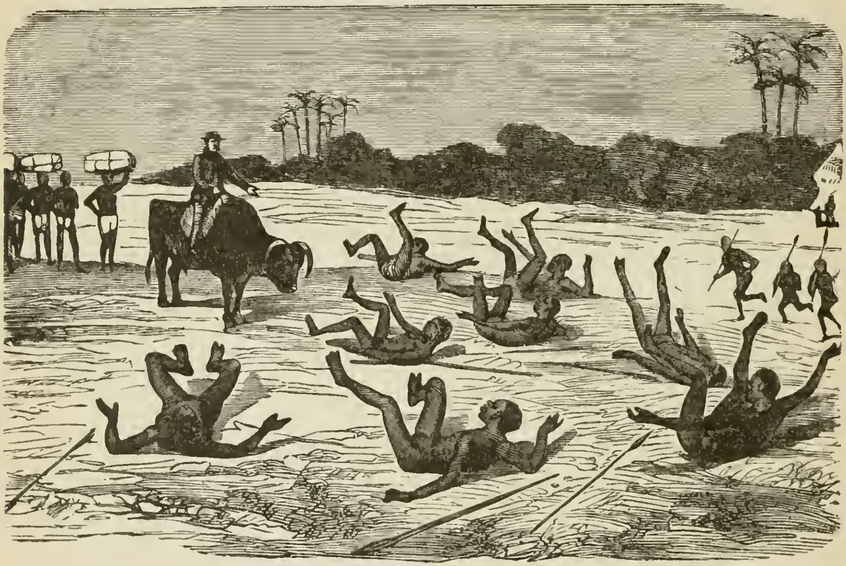
A grand meeting of all the people was held to welcome the white man back, and wonderful indeed were the stories related at it by his servants of their adventures by the way. They had gone to the end of the world, and only turned back when there was no more land! No; they had not seen Ma-Robert (Mrs. Livingstone), for she lived a little beyond the world, but they had seen mountains (two-storied houses), with several caves in them, inhabited by white men, and so on and so on.

Sekeletu was charmed with his uniform, and when he appeared in it in church the following Sunday it drew off all attention from service or sermon. Offers to accompany Livingstone on his journey to the east coast poured in upon him, and our hero found himself almost too popular. Determined, however, not to lose this favorable opportunity for extending his discoveries, he remained patiently at Linyanti until the 3d November, 1855, when he started for the east, accompanied by Sekeletu and about two hundred of his followers. Sesheke was reached in the thick of a fearful thunderstorm, one of the worst yet encountered by Livingstone, but he tells us that Sekeletu, now his devoted friend, covered him with his own blanket, and before leaving the town presented him with twelve oxen, with some hoes, beads, etc., for the purchase of a canoe for the voyage down the Zambesi.

THE CELEBRATED SMOKE RESOUNDING FALLS.

Embarking on the river at Sesheke, the whole party descended it as far as the island of Kalai, where it makes a sudden bend to the northeast above the world-famous Victoria Falls, called by the natives Mosiatunya, or "Smoke sounds there," a name eminently descriptive of the simultaneous effect produced on ear and eye by the never-ceasing roar of the descending cataract and the smoke-like masses of ever-ascending foam. These falls are the Niagara of Africa, and through the descriptions already given have gained a world-wide fame. They are one of the wonders of the world.

Says Livingstone,—"Five columns of vapor arose, and, bending in the direction of the wind, they seemed placed against a low ridge covered with trees; the tops of the columns appeared to mingle with the clouds. They were white below, and higher up became dark, so as to simulate smoke very closely. The whole scene was extremely beautiful; the banks and islands dotted over the river are adorned with sylvan vegetation of great variety of color and form. At the period of our visit several trees were spangled over with blossoms. There, towering over all, stands the great burly baobab, each of whose enormous arms would



BATOKA SALUTATION.

form the trunk of a large tree, beside a group of graceful palms, which, with their feathery-shaped leaves depicted on the sky, lend their beauty to the scene. The falls are bounded on three sides by ridges three hundred or four hundred feet in height, which are covered with forest, with the red soil appearing among the trees. When about half a mile from the falls, I left the canoe by which we had come down thus far, and embarked in a lighter one with men well acquainted with the rapids, who, by passing down the centre of the stream, in the eddies and still places caused by the many jutting rocks, brought me to an island situated in the middle of the river, and on the edge of the lip over which the water rolls. Though we had reached the island, and were within a few yards of the spot, a view from which would solve the whole problem, I believe that no one could perceive where the vast body of water went; it seemed to lose itself in the earth, the opposite lip of the fissure into which it disappeared being only eighty feet distant. Creeping with awe to the verge, I peered down into a large rent which had been made from bank to bank of the broad Zambesi, and saw that a stream one thousand yards broad leaped down one hundred feet, and then became suddenly compressed into a space of fifteen or twenty yards. The entire falls are simply a crack made in a hard basaltic rock, from the right to the left bank of the Zambesi, and then prolonged from the left bank away through thirty or forty miles of hills. In looking into the fissure on the right side of the island, one sees nothing but a dense white cloud, which, at the time we visited the spot, had two bright rainbows on it. From this cloud rushed up a great jet of vapor, exactly like steam, and it mounted two hundred or three hundred feet high; there condensing, it changed its hue to that of dark smoke, and came back in a constant shower, which wetted us to our skin."

Leaving these stupendous falls, and the valley in which the Lekone flows, at the village of Moyara, Livingstone directed his course more to the northeast, through a tract of country once thickly populated, but now bare and desolate from constant wars, then across treeless undulating plains, where the tuskless elephant and large herds of buffalo are seen. Here, too, is heard the singular whistle of the honey-guide, which sounds like, "Come and see! come and see!" And if one follows it, as it slowly flies away, he is soon brought to some hollow tree in which wild bees have stored up their honey. Now the ruins of large and depopulated towns were seen, which most likely the slave-trader had stormed in the night, and presently they came to where the natives were in rebellion, and feared an attack; but beyond these the Batoka or Batonga people were quite friendly, and hailed with loud shouts the appearance of the first white man that had ever visited their country, and saluted him by throwing themselves on their backs, rolling in the dust, and slapping their thighs, exclaiming "*Kina bomba.*" Thus onward, ever onward, with varied fortune, the noble traveler pushed forward his sable attendants, until on March 3d, 1856, Tette was reached, and he was hospitably received by the Portuguese commandant.

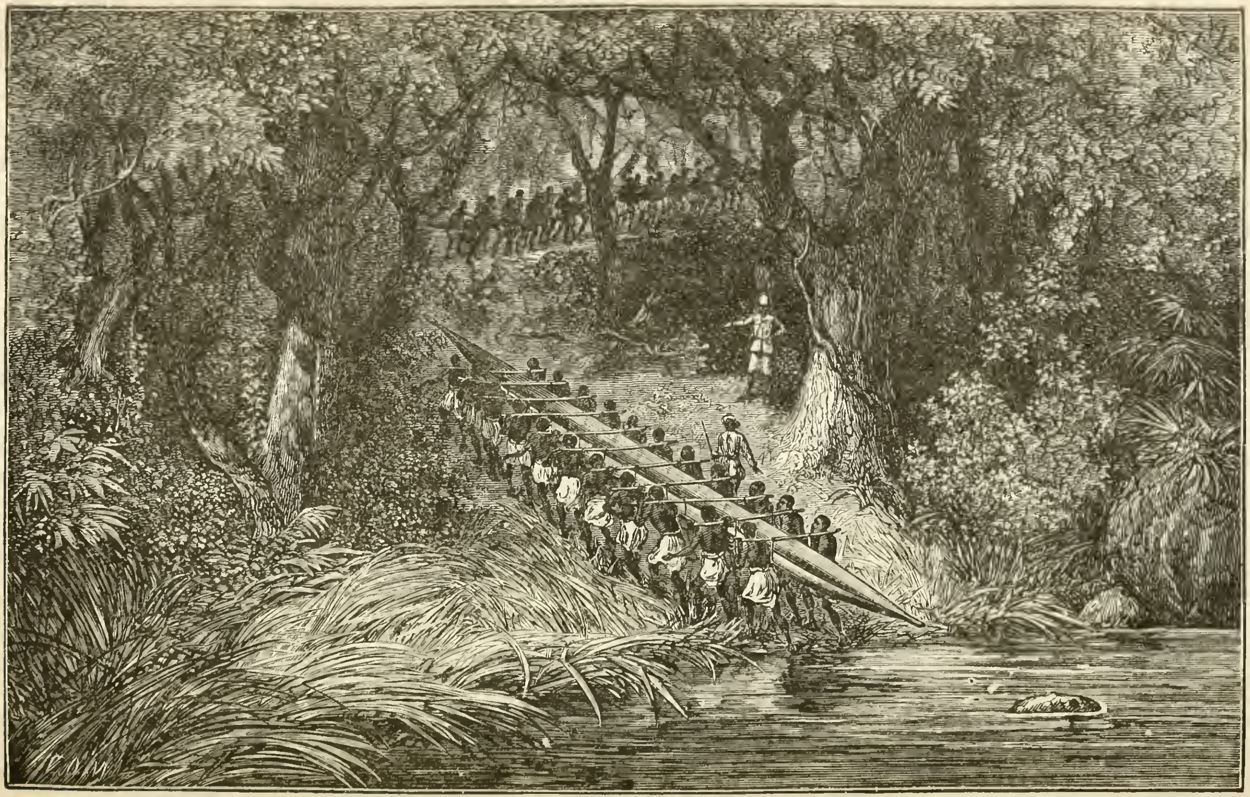
CHAPTER II.

LIVINGSTONE'S DISCOVERIES.

Arrival at the Mouth of the Zambesi—The Ma-Bobert—War between the Half-castes and the Portuguese—Livingstone's old Makololo Servants—Their Sufferings in his Absence—Excursion to Kebrabasa—First Visit to Manganja Land—On Foot to Lake Shirwa—Bad Behavior of the Ma-Robert—Up the Shire again, and Discovery of Lake Nyassa—Journey to Makololo Land—Rescue of Baldwin at the Victoria Falls—News of Sekeletu's Leprosy, and the Misery of his People—Arrival at Sesheke—Interview with Sekeletu—His Lady-Doctor superseded by Kirk and Livingstone—Over the Rapids, and Narrow Escapes—On Foot to Tete—The Last of the Ma-Robert—Arrival of Pioneer and of Bishop Mackenzie—A Struggle with Ajawa—New Expedition Resolved on—Desertion of Johanna Men—Report of Livingstone's Death—Search Expedition under Young—The Mazitu—Further Desertions and Loss of Medicine Chest—Arrival at Tanganyika—Off for Lake Moero at Last—Down the Lake to Cazembe's—War and Rumors of War—Flight to the North with the Arabs—Back to Tanganyika, and Awful Sufferings by the Way—Across the Lake to Ujiji—Back again to the Western Shores—Start for Manyuema—Desertion of all the Men but Five—Awful Massacre of Native Women—An Ambush and Narrow Escape—Cannibalism—Arrival at Ujiji in an Exhausted State—Opportune Arrival of Stanley.

THE cordial reception he had almost everywhere met with on his great journey from sea to sea, and the apparent eagerness of the natives of the inland districts to trade with the settlers on the coast, led Livingstone to hope that in the new venture now to be undertaken he would be able, without any great difficulty, to open permanent commercial relations between African chiefs and Europe. With this end in view, he proposed thoroughly surveying the Zambesi, with its mouths and tributaries, for, from what he had already seen of that great river, he believed it to be the best and most natural highway for commerce and Christianity to pass into the vast interior of Africa.

The new expedition consisted of Dr. Livingstone as leader; his brother, Mr. Charles Livingstone; Dr. Kirk, a well-known botanist; Mr. Thornton, a young geologist, and numerous others of lesser note. Provided with a boat for river navigation—which was sent from England in pieces, and put together at the mouth of the Zambesi—and all other requisites of success, the party arrived off the east coast, in her Majesty's colonial steamer Pearl, in May, 1858, and carefully examined the four mouths of the Zambesi. The Pearl proceeded rapidly up one, the Kongone, towing the Ma-Robert, as the steam launch was called, that



NATIVES CONVEYING THE BOATS OVER LAND.

being the native name for Mrs. Livingstone; and after a pleasant voyage between banks lined with huge ferns, palm bushes, wild date, screw and other palms, etc., cast anchor near the island of Simbo.

RESCUE OF A PORTUGUESE GOVERNOR.

A little later Livingstone and his comrades were within hearing of a fight between the Portuguese and the "rebels," and on landing opposite to Shapunga to greet some old friends, the doctor found himself in the midst of mutilated bodies, and surrounded by all the horrible sights and sounds connected with recent carnage. The few survivors of the people he had known under circumstances so different gathered about him, glad to welcome him again, and he was requested to take the Portuguese governor, who was very ill of fever, across to Shapunga.

No sooner had he given his consent than the battle recommenced, and with balls whistling about his ears he "dragged his Excellency," a very tall and heavy man, down to the ship. Once on board, and under skillful treatment, the poor man quickly recovered his health, and was able to return to Quilimane, but it is said that he never forgave the colonel in attendance for the strong remedies which were administered to him. He was a pupil of Raspail, and felt it a crime to get well by any other method than his. We quote this anecdote as one out of many examples of the absurd prejudices against medicine prevalent alike amongst Portuguese settlers, half-castes, and natives in this part of Africa, prejudices which again and again prevented Livingstone from saving life.

Leaving Shapunga, our party started up stream for Tete, finding the navigation very difficult, owing partly to the number of islands to be avoided, and partly to the vagaries of their black pilot, John Scissors, who sometimes took the wrong channel, running the Ma-Robert aground. "Nothing abashed," says Livingstone, "by these little accidents, he would exclaim, in an aggrieved tone, 'This is not the path; it is back yonder.' 'Then why didn't you go yonder at first?' growled the Kroomen, who had been engaged as sailors, and had the work of getting the vessel off; at which demonstration of displeasure poor Scissors would begin to tremble and cry, 'These men scold me so, I am ready to run away.'"

From the first the Ma-Robert behaved so badly, owing to various faults in her construction, that Livingstone ironically re-christened her the "Asthmatic." The heavily-laden country canoes could almost keep up with her, the little ones shot by her, and with regret our hero was compelled to acknowledge that steam was to him no labor-saving power, and boats, or even canoes, would have done for the expedition all that *it* did, with half the toil and expense.

Landing to wood at Shamoara, just below the confluence of the Shire, an important tributary of the Zambesi, with which we shall presently become well acquainted, the Englishmen were visited by Bonga, brother of Matakenya, and some of his principal followers, who were all perfectly friendly, though aware of the service done by the explorers to their enemies in the person of the governor of Mazaro. Bonga, when told of the object of the expedition, declared that no hindrance should be suffered from his people in so good a work, and proved that these were no idle words by sending down a present of rice, two sheep, and a quantity of firewood. The Portuguese, on the other hand, showed themselves suspicious of the intruders, and cross-questioned their pilot as to whether they had sold any powder to the enemy; but in spite of all difficulties our hero managed to remain on good terms with both parties.

Unable to take the Ma-Robert up the shoal-channel on which Sena, the next halting place, stands, anchor was cast at a small native hamlet, called Nyaruka, and the Englishmen walked across country in Indian file along a narrow, winding footpath, through gardens and patches of wood, meeting many natives on the road, the men armed with spears, bows and arrows, or old Tower muskets; the women carrying short-handled hoes, with which they were going to work in the gardens.

Arrived at Sena, a tumble-down Portuguese settlement, surrounded by a stockade of living trees to protect its inhabitants from their troublesome and rebellious neighbors, the party were most hospitably received by the now celebrated Senhor Ferrâo, who has won the love of the natives by his noble generosity, feeding them in famine, ministering to them in sickness, and exercising no further right over his slaves than that of a kind of patriarchal chief, on whom they lean as on a father.

A HAPPY MEETING.

Cheered by their halt in what we may call this oasis in the very heart of the slave district, our heroes pressed on up stream with fresh energy, and cast anchor off Tete on the 8th September, 1858. Dr. Livingstone at once went on shore in a boat, for it was here he had left many of his old Makololo servants on his former journey. No sooner did the poor fellows recognize him than they rushed to the water's edge, manifesting the greatest joy at seeing him again. "Some," to quote from his own narrative, "were hastening to embrace him, but others cried out, 'Don't touch him; you will spoil his new clothes.'"

On his visit to Kebrabasa, with Dr. Kirk as his companion, Livingstone discovered a beautiful cataract, known as Morumbwe, at the cost of a climb up an almost perpendicular mountain under a burning sun, the faithful Makololo who had constituted themselves his escort murmuring that they had always thought their master had a heart, but now they believed he had none. Finding him immovable in his determination to proceed, they turned to Dr. Kirk and begged him to make his companion go back, for it was evident he was gone mad, else why did he attempt to go where no living foot could tread?

To this appeal Dr. Kirk, who understood not a word, made no reply, and Livingstone naively informs us that he, who did understand, took care not to enlighten him. The discovery made, he adds, was more than sufficient reward for the labor undergone, and having slept for the night at a well in a rock on the north-west side of the mountain, rising perpendicularly above the Zambesi, the hardy explorers returned to Tete, and after some few interesting but unimportant excursions in its neighborhood, the whole party started on a first trip up the Shire.

STOPPED BY THE SAVAGES.

It was now early in January, 1859, and considerable quantities of duckweed floated down the river for the first twenty-five miles, though not enough seriously to impede navigation. Entering the Manganja country, peopled, according to the Portuguese of Tete, by bloodthirsty savages, a sharp lookout was kept on either side of the little vessel, and as the first villages were approached the natives collected in large numbers, armed with bows and poisoned arrows. No actual hostilities were offered, however, until the village of a chief named Tingane was reached, when a party of five hundred savages collected on the river banks, and ordered the Ma-Robert to stop.

Dr. Livingstone landed at once, and in an interview with Tingane, explained that he and his companions were English, that they had come neither to take slaves nor to fight, but only to open a path by which their countrymen might follow to purchase cotton, or whatever else they might have to sell, except slaves.

To our hero's surprise, Tingane responded to this speech in a friendly manner. The chief, long notorious as being a barrier to all intercourse between the Portuguese and natives further inland, allowing none to pass him either way, gave the expedition permission to proceed, and appeared fully to recognize the advantages which its success would bring to his country. Probably the presence of the steamer, a machine with unknown powers of good and evil, contributed to this result, but, however that may be, Livingstone lost no time in profiting by Tingane's friendliness, and pushing up stream, the river becoming narrower as he advanced, he came, one hundred miles further, to a magnificent cataract, which he named the Murchison Falls, after his friend Sir Roderick.

Here the progress of the steamer was stopped, and it was decided to return to Tete, first paving the way for a new expedition by sending presents and messages to two Manganja chiefs. The progress down stream was rapid. The hippopotami, with which the Shire abounded, says Livingstone, never made a mistake, but got out of our way. The crocodiles, not so wise, sometimes rushed with great velocity at us, thinking we were some huge animal swimming. They kept about a foot from the surface, but made three well-defined ripples from the feet and body; raising the head out of the water when only a few yards from the expected feast, down they went to the bottom without touching the boat.

In the middle of March of the same year (1859) a second trip was made up the Shire, this time resulting in the discovery of Lake Shirwa. Friendly relations were opened, to begin with, with Chibisa, chief of a village ten miles below the cataracts, and, leaving their vessel under his care, Dr. Livingstone and Kirk, attended by a number of Makololo, started on foot in the direction of the lake.

TREACHEROUS GUIDES.

The people of the districts traversed were anything but friendly, and some of the guides tried to mislead them. Masakasa, a Màkololo headman, overheard certain remarks betraying their plots, and fixing upon one man, who it afterwards turned out was innocent of everything but ignorance, said to Dr. Livingstone, "That fellow is bad; he is taking us into mischief. My spear is sharp; shall I cast him into the long grass?"

Of course our hero declined to sanction assassination, but presently agreed with Kirk to dispense with guides altogether, and push on alone. In carrying out this determination they received assistance from a very unexpected quarter, none other than the madmen of the different villages entered. The poor fellows, evidently imagining the explorers to belong to their own unhappy condition, sympathized with them, and guided them faithfully from place to place as no sane men would have done. In April the lake was reached, and turned out to be a large mass of bitter water, abounding in hippopotami, crocodiles, leeches, and fish.

About the middle of August we find the explorers again on their way up the Shire, this time intending to make a long journey on foot to the north of Lake Shirwa, with a view to the discovery of Lake Nyassa (the stars).

ADVENTURE WITH A YOUNG ELEPHANT.

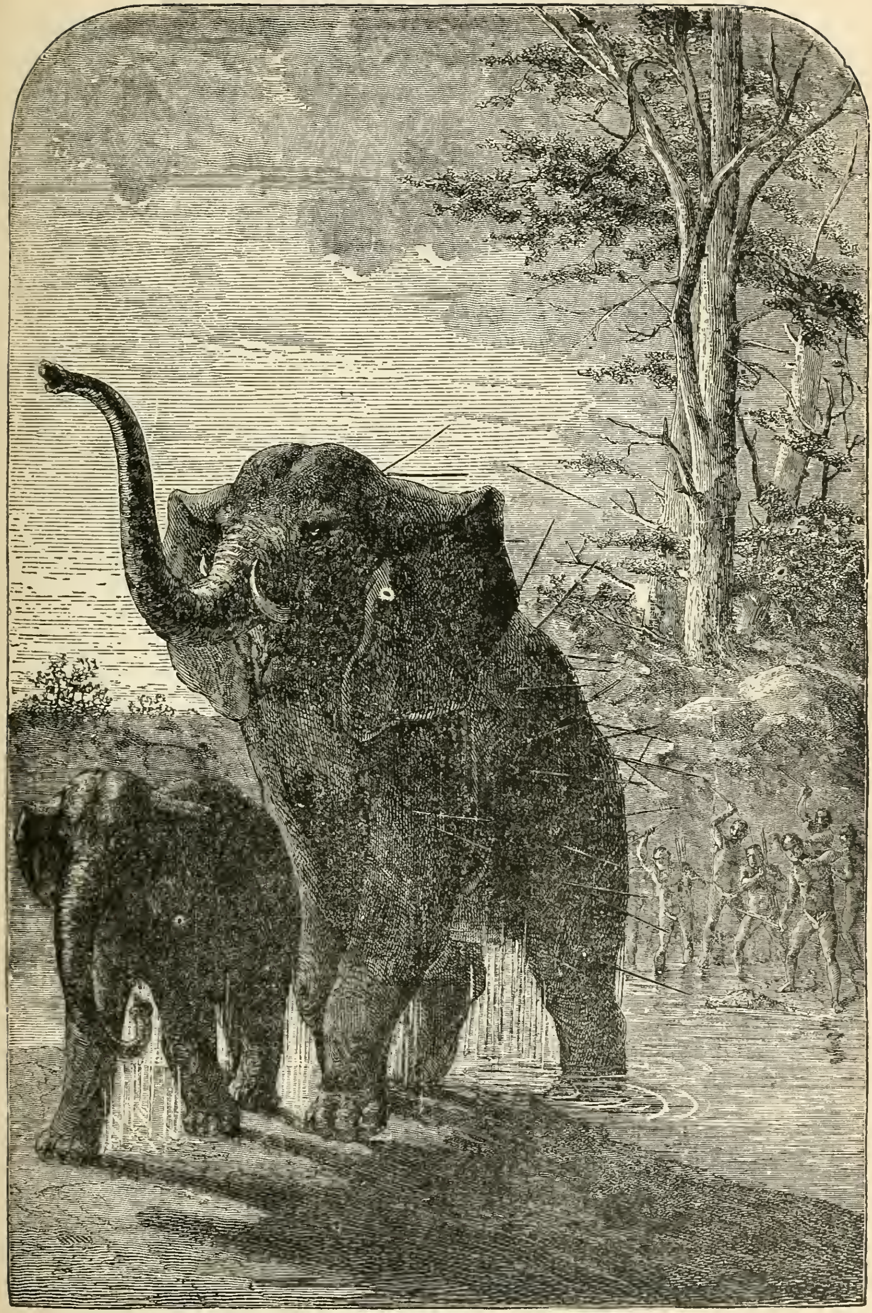
Tingane's village was passed in safety, and in the so-called Elephant Marsh beyond it a fine young elephant was caught alive as he was scudding up the river bank after his retreating mother. When seized, the poor beast gave a terrible scream, and to avoid an attack from his enraged parent, his captors steamed off, dragging him through the water by his trunk. Presently, to Livingstone's great regret, Monga, a

Makololo elephant-hunter, suddenly rushed forward and drew his knife across the extended proboscis, "in a sort of frenzy peculiar to the chase." The wound was at once skillfully sewn up, and the young animal soon became quite tame, but, unfortunately, his breathing prevented the cut from healing, and he died a few days afterwards from loss of blood. Had he survived to be brought home, he would have been the first African elephant seen in a civilized country.

The upper terrace of the Manganja highlands, some three thousand feet above the sea-level, was reached after an arduous climb, and a week's journey across a rocky plateau in a northerly direction was succeeded by the descent into the Upper Shire valley, a wonderfully fertile district, supporting a large population, and lying twelve hundred feet above the sea-level. Part of this favored valley was under the rule of a female chief named Nyango, and in her dominions, says Livingstone, women ranked higher and received more respectful treatment than their sisters on the hills.

As an instance of this difference, he tells us how, when one of the hill chiefs, Mongazi by name, called his wife to take charge of a present brought for him by the white man, "she dropped on her knees, clapping her hands in reverence both before and after receiving the present from his lordly hands;" whereas, in Nyango's country, the husbands consulted their wives before concluding a bargain, and seemed to respect their opinions. On entering a Manganja village, the explorers always proceeded, as is the custom for strangers, to the Baolo or spreading-place, generally an open space of some twenty or thirty yards in extent, beneath a banyan tree. Mats of split reeds or bamboos were spread for their accommodation, and sitting down, the white men left the guides to explain to the villagers whence they came, whither they were going, and what was the object of their visit.

This information was then carried to the chief, who, if a sensible man, came at once to receive his guests; and if he happened to be timid and suspicious, waited till he had used divination, and his warriors had time to come in from the outlying hamlets. On the arrival of the chief, the people begin to clap their hands, and continue to do so till he sits down opposite his visitors. The guides then squat themselves between the two parties, facing the chief, who stares fixedly at them, and they at him. A single word is at last uttered by the chief, such as Ambuiatu (our Father) or Moio (life), and all again clap their hands. A second word is followed by two claps, a third by three, after which all rise, lean forward with measured clap, and sit down again with clap, clap, clap, fainter and still fainter, till the last dies away or is brought to an end by a smart, loud clap from the chief. The guides then repeat the informa-



FEMALE ELEPHANT PROTECTING HER YOUNG.

tion already given to the people to the chief, conversation is opened with the white men by means of interpreters, presents are ceremoniously exchanged, and at last food, such as meal, maize, fowls, etc., is brought for sale.

Beyond the cataracts already mentioned, the banks of the Shire, now dwindled into a rivulet, were followed, and on arriving at the village of a chief, really only a day's march from the Lake Nyassa, the explorers were told that no sheet of water existed anywhere near, but that the river Shire stretched on for "two months" more, and then came out between perpendicular rocks which towered almost to the very skies. The Makololo looked very blank at this news, and all cried, "Let us go back to the ship; it is no use trying to find the lake." "No, no," answered Dr. Livingstone; "we shall go and see these wonderful rocks at any rate." "And when you see them, you will just want to see something else," was the rejoinder; an answer showing how well his men had learnt to know the great explorer's indomitable energies. Further inquiries in this instance resulted in an admission that there was a lake not many miles off, and it was determined to start for it early next day.

A CHIEF'S WIFE DEVOURED BY A CROCODILE.

Preparations for the night were already begun, and the four Englishmen were congratulating themselves on the near approach to success, when a wild, sad cry arose from the river, followed by the shrieking of women. The chief's principal wife had been carried off by a crocodile when bathing. The Makololo rushed to the bank to try and rescue her, but it was too late; she was gone. This terrible accident was associated with the visit of the white men; they were looked upon with awe; all the males fled at their approach, and the women gazed at them in awe-struck silence, their dusky cheeks blanched with fear.

The start for the lake the next morning was made under gloomy auspices, and it was with something of foreboding that the party left the village behind them, uncheered by any good wishes from their host, and with nothing to guide them in their search but their own instinct.

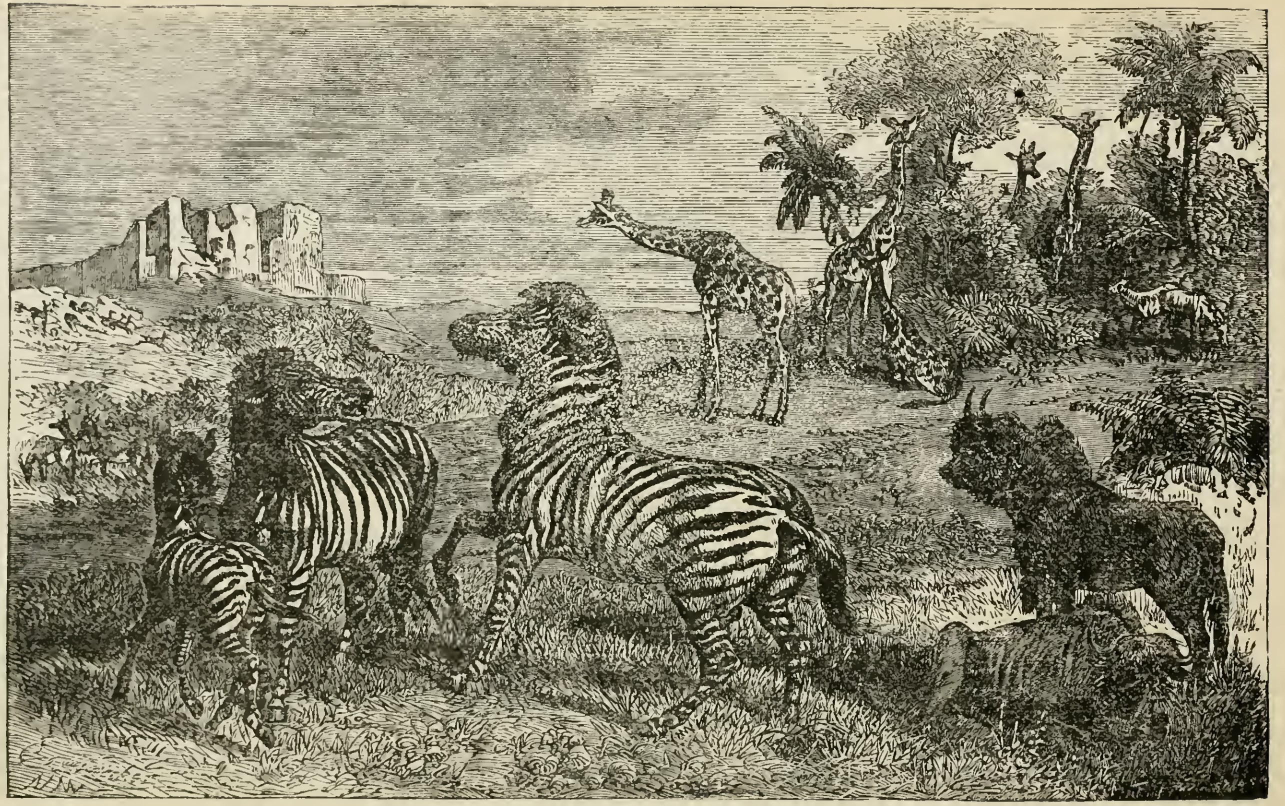
All went well, however, and our heroes stood at last upon the shores of the southern extremity of Lake Nyassa. The chief of the village near the source of the Shire, an old man named Mosanka, hearing that the four white men were sitting under a tree, came and invited them into his domain, and taking them to a splendid banyan tree, urged them to make themselves at home beneath it. He then sent them a goat and a basket of meal, "to comfort their hearts," and when they had refreshed themselves, he informed them that a large party of slave-hunters, led by Arabs, was encamped close by. They had been up to Cazembe's country on the north the previous year, and were now returning south with a good supply of slaves, ivory, and malachite. A little later some of the leaders came over to call on the visitors, who found them a "villainous-looking lot," Livingstone adding in his journal, "but probably they thought the same of us, for they offered us several young children for sale." When told that the white men were English, they seemed both annoyed and frightened, and made off as quickly as they could. Mosanka's village is set down in one of the great slave paths from the interior, and Livingstone saw many unhappy victims being led along in the so-called slave-sticks, long poles with two arms at one end, between which the head of the captive is fixed.

THE CAMP ENCIRCLED BY FIRE.

After a somewhat disheartening land journey, occupying forty-five days, the explorers returned to the ship, and whilst the two Livingstones steamed down the Shire, Dr. Kirk and Mr. Rae, the engineer, returned to Tete overland, accomplishing the journey without difficulty. A little later the Ma-Robert was taken down to the Kongone for further repairs, etc., and in May we find Dr. Livingstone preparing for a journey to the Makololo country, to take his faithful servants home. The plains of Chicova were haunted at night by so many lions that great precautions were necessary to ensure the safety of the camp. The white men were always placed in the centre, and the natives arranged themselves in picturesque style all around, forming a kind of body-guard, whilst a huge circle of fire enclosed the whole body of travelers.

The chief of the plain, Chitora by name, who had never before seen white men, rejoiced that he had been spared to do so, and sent them presents of food and drink, because he said, he did not wish them to sleep hungry; he had heard of the doctor when he passed down, and had a great desire to see and converse with him, but he was a child then, and could not speak in the presence of great men.

The people of the villages, however, were less eager in their attentions, and Livingstone remarks that there must be something frightfully repulsive in the appearance of Europeans to the unsophisticated blacks, for many of those who had never before seen any but their own countrymen would take to their heels in an agony of terror at the approach of himself or his companions. This terror is even sometimes communicated to the brute creation, dogs turning tail and scouring off in dismay, and hens abandoning their chickens, flying screaming to the tops of the houses. A little familiarity with the English was, however, always enough to convert this dread into affectionate regard, as their visitors always aimed to treat them with kindness, and in this way secured their good will. Livingstone's method was that of



ANIMALS OF THE TROPICS.

conciliation, and he was very successful in gaining the friendship of the natives. Thus he passed unharmed through the wildest parts of that wild country.

Pressing on along the Zambesi, and with "zigzags" of fire, the result of grass-burning on the hills, running parallel with their course, the explorers had a narrow escape on the 6th June, when traversing a dense thorn jungle. In cutting their path step by step they became separated from each other, and a rhinoceros with angry snort dashed at Dr. Livingstone as he stooped to pick up a specimen of the wild fruit morala; but, strange to say, she stopped stock-still when less than her own length distant, and gave him time to escape. As he was running off, however, a branch of a tree caught his watch chain and dragged out his watch. Turning half round to secure it, he saw the rhinoceros, with a young one beside her, standing still, as if arrested in the middle of her charge by an unseen hand. When about fifty yards off, Livingstone shouted to his comrades, whom he knew to be within hearing, though out of sight, "Look out there!" and his enemy, snorting loudly, rushed off in the opposite direction.

Meanwhile, Charles Livingstone had surprised a troop of wild dogs wrangling over the remains of a buffalo they had dragged down and nearly devoured, and only escaped sharing its fate by beating a retreat, whilst Dr. Kirk brought down a fine eland later in the day. The jungle safely traversed, and the open country entered, the villages of old friends were reached one after another, and in August, 1860, we find Dr. Livingstone again at the Victoria Falls of the Zambesi, now sharing with his fellow-countrymen his delight in the glorious scene they present.

RESCUE OF A WHITE MAN.

At the village of chief Mashotlane, near the Falls, the travelers found an Englishman, named Baldwin, held a kind of prisoner at large, and, rescuing him from his captivity enabled him to regain his wagon two days' distance off. Baldwin, having heard of Livingstone's discovery of the marvelous cataract, had managed to reach it from Natal, guided by his pocket compass alone. He had called on Mashotlane to ferry him over to the north side of the river, and when nearly over he took a bath by jumping in and swimming ashore, thus greatly incensing the native chief, who said, "If he had been devoured by one of the crocodiles which abound here, the English would have blamed us for his death. He nearly inflicted a great injury upon us; therefore he must pay a fine." As poor Baldwin had nothing with him to meet this demand, he would probably long have languished in exile but for the timely arrival of our heroes.

Marching up the river, the Lekone was crossed at its junction with the Zambesi, and a party was met, sent by Chief Sekeletu to greet the explorer, and ask him, not, as he expected, again to make Sesheke his home, but to say what the price of a horse ought to be. Livingstone declined to give an opinion, and the envoys expressed themselves greatly disappointed, for if he would have spoken, the matter would have been settled, as the Griquas, with whom a sale was being negotiated, would have accepted his opinion as final.

A CHIEF SMITTEN WITH LEPROSY.

The envoys dismissed, the camp was pitched opposite the mouth of the Chobe, and a Makololo headman named Mokompa sent a liberal present, and two canoes to take the white men up to Sesheke, but accompanied by a message that he feared his tribe was breaking up. Sekeletu had the leprosy ; he did not know what was to become of his people. The coldness of the unhappy Makololo chief was now explained ; the princely warrior, whom Livingstone had left in the enjoyment of all the vigor of youth, was struck down by a foul disease, and had shut himself up to die alone. His dreams of a new era for his people were over. Instead of encouraging missionaries to settle in his country, instead of inviting traders from the east and from the west to bring their goods to his capital, he must end his days in a self-imposed prison. He would not risk the spread of his complaint amongst his children, and there is something infinitely touching in his sending yet another message to Livingstone to say that he only should come to him, and to ask him again about the price of the horse. It was evident that he could not bear to allude directly to the terrible trouble which had overtaken him.

On the 18th, Livingstone and his party entered Sesheke, or rather passed the ruins of the former to go to its substitute, built on the same side of the river a quarter of a mile higher up, the former Sesheke having been leveled to the ground after the execution of the headman Moriantsiane for bewitching the chief with leprosy. Sekeletu was on the right bank, near a number of temporary huts, and a man hailed our heroes on the chief's behalf, and requested them to rest under the old kotla, or public meeting-place tree. This they did, as they were desired. A young Makololo then crossed over the river to receive the chief's orders, and soon returned with a message to the headman of the new town, to the effect that an ox was to be slain for the white men. This was duly done, and never, they tell us, did they taste better meat, for, on their arrival at Sesheke, they had been entirely out of food.

The next day, visitors poured in to see Dr. Livingstone, and many of them who had been in trouble since his previous visit were much affected in the first interview. One and all were in low spirits. A severe drought had cut off all the crops, and destroyed the pastures of Linyanti, and the people, as they expressed it, were in search of wild fruits and the hospitality of those whose ground nuts had not failed.

A FEMALE QUACK.

Many and terrible too were the evils Sekeletu's leprosy had brought in its train. Believing himself bewitched, he had put several of his chief men and their families to death; others suspected of having a hand in the matter had fled to distant tribes, and were living in exile. No one was allowed to approach the afflicted chief but his uncle Mamire, his mother, and an old doctress from the Manyebi tribe, who—the Makololo doctors having given him up—was trying what she could do for him. On this old crone the last hopes of chief and nation hung.

Worse still, if anything could be worse, the grand empire founded by Sebituane, was crumbling to pieces, the young Barotse in the charming valley where the chief and his white guest had been so eagerly received in 1855 were in revolt, the Batoka and the Nmemba had thrown off their allegiance to Sekeletu, and Mashotlane at the Falls was setting his superior at defiance.

Fearful rumors, too, were afloat as to the nature of the sufferings of the invisible Sekeletu. His fingers, it was said, were grown like eagle's claws; his face was so frightfully distorted that no one could recognize him. Perhaps, after all, he was no true son of Sebituane, and so on, and so on. In a word, the power of the once renowned chieftain was broken forever, and with it the prestige of his people. At his death, a few years after the time of which we are now writing, a civil war broke out about the succession to the chieftainship, and the kingdom was broken up. The Makololo exist no longer as a nation.

Touched to the heart by all he heard and saw, Livingstone sent messages begging the chief to admit him to an interview, and the day after their arrival the two doctors and Charles Livingstone were allowed to see the unhappy prince. He was sitting in a covered wagon enclosed in a high wall of close-set reeds; his face turned out to be but slightly disfigured by the thickening of the skin here and there, and the only peculiarity about his hands was the extreme length of his finger nails, nothing remarkable in Makololo country, as all its natives allow them to grow very long.

Sekeletu begged for medicine and medical attendance, but Livingstone was unwilling to take the case out of the hands of the lady doctor already mentioned, for, apart from his belief in the incurability of the disease, it would have been bad policy to undervalue any of the native profession. When appealed to, the female practitioner declared she had not yet given up her patient; she would try for another month, and if he was not cured by that time, then she would hand him over to the white doctors.

Now a month was the utmost limit of the time our heroes intended remaining at Sesheke, and, yielding to Sekeletu's earnest wishes, backed by those of his uncle and others, the old lady finally consented to suspend her treatment for a time, remaining, however, in the chief's establishment on full pay. Drs. Livingstone and Kirk were then persuaded to try what they could do, and having plainly told Sekeletu that they had little hope of a good result, they set to work.

CURING THE LEPER.

Having none of the medicines with them which are usually employed in skin diseases, Drs. Livingstone and Kirk tried the outward application of lunar caustic or fused nitrate of silver, and dosed their patient with hydriodate of potash, not without much trepidation as to the consequences. Fortunately for them, their treatment was wonderfully efficacious; Sekeletu began to improve at once; his skin became thinner, and the deformity of his face disappeared entirely, indicating a speedy cure. The old doctress, jealous of the success of her rivals, and anxious to share the credit of this improvement, now secretly applied her own remedies, which consisted in scraping the unlucky chief s skin and rubbing it with an astringent powder. On a hint, however, that the medicines of the white and black doctors might not work well together, she desisted. In treating their patient, Drs. Livingstone and Kirk caught something of his disease, the skin of their hands becoming thickened and discolored in a similar manner, but they were fortunately soon cured by the use of caustic.

Though there was a famine in the land during their stay at Sesheke, Sekeletu treated his guests right royally, preparing tea for them on every visit paid to him, and ordering his headman to provide them with food in the absence of his wives at Linyanti. Sekeletu was delighted with the presents given to him, and asked if a ship could not bring him the things which he heard had been left at Tete. On being told that a steamer might possibly ascend part of the Zambesi, but could never pass the Victoria Falls, he suggested that a cannon should be brought to blow away the impediment, so that the vessel might come all the way to Sesheke.

Whilst in Makololo Land, our heroes heard of the melancholy fate of a large party of missionaries who had endeavored to settle at Linyanti. Six out of nine Europeans, and four out of thirteen men of color, making up the missionary party, succumbed to fever in the short space of three months, and the little remnant returned to the Cape broken alike in health and spirits. The three explorers took leave of Sekeletu, and, escorted by a large party of traders, made their way on foot to the village of Sinamene, where they embarked on the Zambesi in canoes supplied by that chief. The rapids of Nakansalo having been shot with some difficulty, the more serious ones of Makabele, at the entrance to the Kariba gorge, had to be passed.

PERILS OF THE RAPIDS.

The Makololo, says Livingstone, guided the canoe admirably through the opening in the dyke; but when the gorge itself was entered it was full of hippopotami swimming about behind a bank stretching two-thirds across the narrowed river. Several were in the channel, and the canoe-men were afraid to venture down among them, because, as they affirm, there is commonly an ill-natured one in a herd which takes a malignant pleasure in upsetting canoes. Two or three boys on the rocks opposite amused themselves by throwing stones at the frightened animals, and hit several on the head.

A few shots were fired to drive the hippopotami off, and one was killed. It floated down the rapid current, and its companions swam hastily off. Had it been only wounded, it would probably have gone hard with the canoes; but, as it was, all shot the rapids in safety, though natives on the banks shouted out that the white men had better hire a Kariba man to pray to the gods of the gorge for their protection, or they would all be killed. The hippopotamus was taken in tow beyond the rapids, and cut up on the banks near the place chosen for pitching the camp for the night. The crocodiles of the river, which had followed the canoes, and tugged hard at the dead hippopotamus, had a gala time of it, as well as the natives, and Livingstone tells us that they tore away at the parts of the carcass thrown into the river for hours, thrashing the water into foam with their powerful tails.

A GALLANT RESCUE.

The next difficulty in the navigation of the Zambesi occurred where the river was again narrowed into one channel by the mountains of Mburuma. In going down, Sekeletu's men behaved admirably, two of them jumping overboard to lighten the canoe containing our heroes, with the words, "The white men must be saved!" They then told a Batoka man to do the same, and on his pleading that he could not swim, replied, "Jump out, then, quick as you can, and hold on to the canoe." The poor fellow did as he was told, and the two Makololo, swimming alongside, guided the swamping canoes down the swift current to the foot of the rapid, and then ran them ashore to bale them out. Everybody and everything escaped with a good ducking, thanks entirely to the bravery of the Makololo.

No sooner was this danger over than another had to be met. A second rapid begins immediately below that of Mburuma. The canoes had to be unloaded, and the goods carried some little distance; but as the men were bringing the last canoe close inshore the stem swung round into the current, and all the men except one loosed their hold lest they should be dragged off. The one man clung to the bow, and was swept out into the middle of the stream. Then, adds Livingstone, "having held on when he ought to have let go, he next put his life in jeopardy by letting go when he ought to have held on, and was in a few seconds swallowed up by a fearful whirlpool." His comrades, who seem to have been equal to every emergency, launched a canoe below the rapids, and as he rose to the surface the third time, caught and saved him, though he was in a state of great exhaustion, and very cold.

The Victoria Falls, the Kebrabasa, Kariba, and minor rapids of the Zambesi, are all, in the opinion of Dr. Livingstone, the result of some terrible convulsion of nature, which occurred in South Africa before the memory of man. All the impediments to the navigation of the Zambesi, except the Victoria, are, however, removed, or, we should rather say, neutralized, when the river is at its height, its course being then smooth and its waters very deep.

Zumbo, at the mouth of the Loangwa, a tributary of the Zambesi, was reached in November, and a few days later the Kebrabasa rapids were entered. Two of the canoes passed safely, but that containing Dr. Kirk was dashed on a projection of the perpendicular rocks by a sudden and mysterious boiling up of the river which occurs at irregular intervals, and Kirk only saved his life by clinging to a projecting ledge. His steersman, hanging on by the same rock, saved the canoe, but nearly all its contents were swept away by the stream. Dr. Livingstone had also a narrow escape, his little bark having drifted into the open vortex of the whirlpool. It was saved by the filling up of the cavity just as the frightful eddy was reached, a coincidence as remarkable as that which had placed his companion's life in jeopardy.

COLLAPSE OF THE "OLD LADY."

After this last experience of river travel the Zambesi was deserted for the land, and the rest of the journey was performed on foot. Tete was entered in safety after an absence of little more than six months, and the river being unusually low, no further excursions were undertaken until December, when the Ma-Robert, whose days were now numbered, was taken down to the Kongone. One morning the "old lady," as she was disrespectfully called by her owners, grounded on a sandbank and filled. She could neither be got off nor unladen. The river rose in the night, and our heroes were compelled to encamp on the island of Chimba, where they spent Christmas day. Canoes were sent for from Sena, and, transferring all the property which could be removed from the Ma-Robert to them, the explorers paddled down the Zambesi without one single regret for the loss of their steamer, which, from the first, had been more trouble than she was worth. Soon a new steamer, named the Pioneer, arrived at Sena for their use, and anchored outside the bar.

We next find Livingstone journeying with Bishop Mackenzie who had arrived on a missionary expedition, and had determined to settle in the Manganja highlands, having received a message from a powerful chief, named Chigunda, inviting him to come and live with him at Magomero, occupying a central position between the Shire and Lake Shirwa. This hearty and spontaneous welcome seemed to offer an opening for the mission not to be neglected, and it was decided that Chigunda's invitation should be accepted. Before parting company, however, missionaries and explorers determined, if possible, to complete the work they had begun together, by visiting the Ajawa chief, and trying to persuade him to give up his slaving and kidnapping courses, and turn the energies of his people to peaceful pursuits.

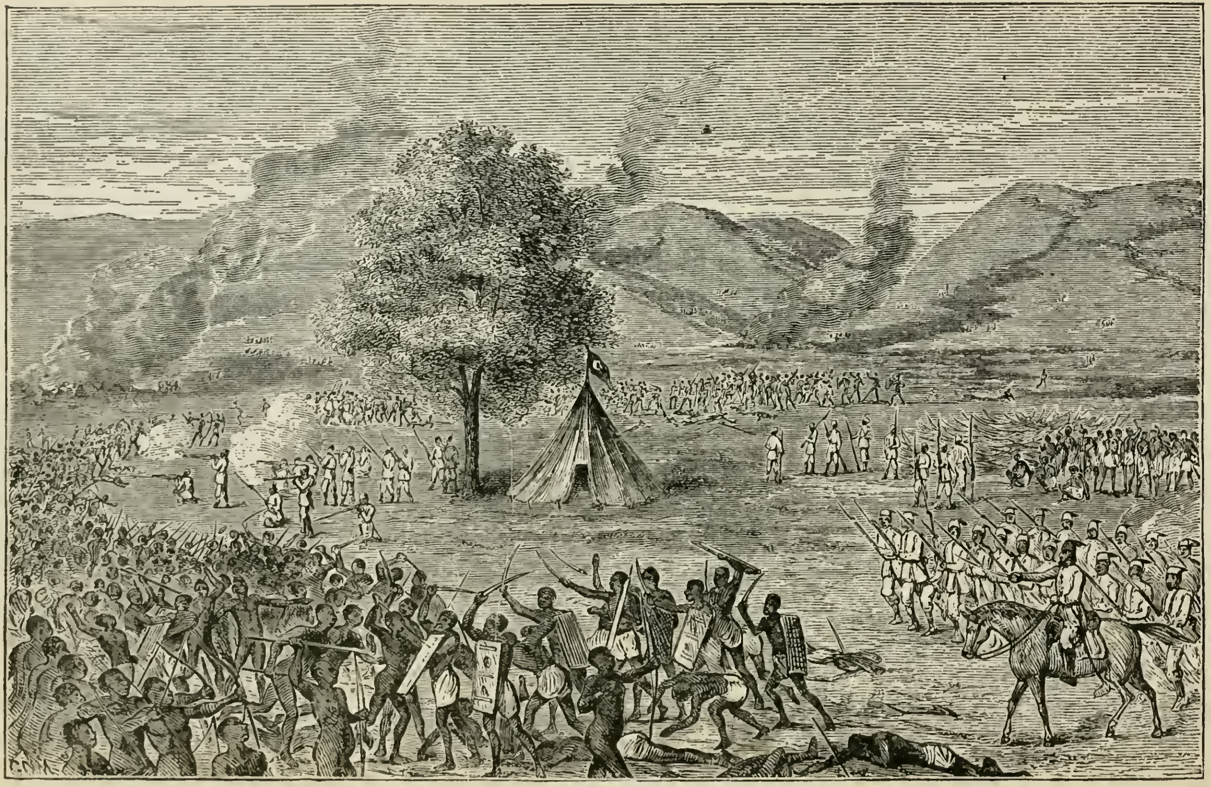
This noble purpose was hastened a few days later by the arrival of the news that the Ajawa were close at hand, burning a village; and, leaving the rescued slaves behind them, the little band of white men set off at once to seek an interview with these scourges of the country. On the way, crowds of Manganja were met fleeing from the war in front, and village after village was passed, deserted by its inhabitants.

A FIERCE ENCOUNTER.

A few hours' march brought our heroes, who, one and all, well deserved that title, in sight of the smoke of burning villages, and within hearing of the wailing of women and the shouting of warriors. The Bishop then called upon all his comrades to kneel, and in their name offered up a fervent prayer to God for help and guidance.

As the worshipers rose from their knees, a long line of Ajawa, with their captives, was seen advancing towards them, whilst in the distance rose the shouts of their women welcoming home the victors with long and reiterated "lillilooings." On recognizing the white men, the Ajawa headman left the path, and stood as if expectant on an ant-hill close by. A brief pause ensued, and then Livingstone and others cried out that they had come to have a peaceful interview, but before any reply could be given some of the Manganja in the Bishop's party shouted, "Our Chibisa is come!"

Now Chibisa was known throughout the length and breadth of the land as a mighty conqueror and general, so that his name spread terror amongst the ranks of the enemy, who ran off "yelling and screaming 'Nkondo! Nkondo!'" (War! War!). The captives threw down their



THE EXPLORERS ATTACKED BY THE AJAWA.

loads and fled to the hills. The consternation was complete, but it did not last long. Almost before the white men had realized that the cry of "Chibisa had come!" had neutralized all their efforts for peace, their party was surrounded by Ajawa, who began to shoot their poisoned arrows, and send up their discordant yell of triumph.

Anxious, if possible even now, to avoid a conflict, Livingstone and Mackenzie led their men slowly up the ascent from the village; but this was taken as a movement of retreat, and a sign of fear. The Ajawa closed in upon the little band with bloodthirsty fury, dancing hideously in their delight at the coming massacre. Only when completely surrounded by the savage warriors did the white leaders give the word to their men to fire, but fortunately the first volley was effective. The Ajawa at once took to their heels, though some of them shouted as they fled that they would return with others in the night to kill all who had interfered with them. Only two slaves were rescued by our heroes on this occasion, but probably most of the other prisoners escaped in the confusion.

After this affray no further molestation was offered to the white men, but they were much worried with requests from the Manganja chieftains to espouse their cause, and aid in driving away the Ajawa. This they of course declined to do, explaining that they never fought except when they were attacked; and finding it was useless to attempt a pacific negotiation between the rival tribes, they decided to return southward.

A FRESH EXPEDITION.

Livingstone returned to his own country, but the beginning of 1866 found him again in Africa, having been solicited both by the government and by private individuals to pursue his discoveries. The Sultan of Zanzibar gave him a hearty reception, and lent him all possible aid, and by the beginning of March he had in his service, in addition to thirteen Sepoys from India, ten Johanna men, two Shapunga men, one of them the now celebrated Susi, two Wayans, the Chumah who with Susi remained with his master to the last, and a certain Wakatani, both of whom were among the slaves liberated in 1861. An Arab dhow was purchased for the transit to the Rovuma of the animals, consisting of six camels, three buffaloes, two mules, and four donkeys, and large stores of merchandise and provisions, were accumulated. No pains, in short, were spared to ensure success.

In September the village of Marenga, situated at the eastern edge of the bottom of the lake, was entered, inhabited by a tribe called Babisa, who had lately joined with the Ajawa in their raids upon the Manganja. The chief of this village, who was suffering from a loathsome skin disease introduced into the country by the Arabs, received Livingstone courteously, but allowed him to proceed northwards without warning him that the Mazitu were ravaging the country through which he must pass. An Arab met the party, and told Musa, one of the Johanna men, that all who ventured further would certainly be murdered; forty-four Arabs had been killed at Kasungu; he only had escaped.

Surprised that he had heard nothing of this from Marenga, and half suspecting foul play, Livingstone lost no time in returning to that chief to inquire if there were any foundation for the story. The reply received was to the effect that it might be true. The natives were very bitter against the Arabs, who were gradually destroying their country. They would allow no more to settle amongst them, but their hostility would not extend to Livingstone or his people, and there were no Mazitu where he was going.

Completely re-assured himself, Livingstone determined to proceed, but the Johanna men had taken alarm. Musa's eyes stood out with terror. He exclaimed, speaking of Marenga, "I no can believe that man;" and when Livingstone inquired how he came to give such ready credence to the Arab, he answered, "I ask him to tell me true, and he say true, true." Reasoning and persuasion were alike in vain. Convinced that they and their master were doomed, the Johanna men resolutely declined to go further, and when the start was again made they went off in a body, leaving their loads on the ground.

STRANGE REPORT OF LIVINGSTONE'S DEATH.

This was the true origin of the report, long believed in England, of the murder of Livingstone by natives on the western shores of Lake Nyassa. The deserters made their way back to Zanzibar, and, anxious to excuse their own conduct, and explain their sudden return, related the following plausible story:

The expedition had safely reached Lake Nyassa and crossed it. The Doctor then pushed on westwards, and in course of time reached Goomani, a fishing village on a river. The people of Goomani warned Livingstone that the Mafites, a wandering predatory tribe, were out on a plundering expedition, and that it would not be safe to continue the journey; but the dangers thus presented to view were not of a nature to deter a man who had braved so many before. Treating the warnings as of little moment, therefore, he crossed the river in canoes the next morning, with his baggage and his train of followers. All the baggage animals had perished from want of water before this river was reached, so that the luggage had to be carried by the men. Being a fast walker, Livingstone soon distanced all his heavily-laden followers except Musa, and two or three others who kept up with him. The march had continued some distance, when Dr. Livingstone saw three armed men ahead, and thereupon he called out to Musa, "The Mafites are out after all." These were the last words he uttered. The Mafites, armed with bows and arrows and axes, closed upon the Doctor, who drew his revolver and shot two. The third, however, got behind him, and with one blow from an axe clove in his head. The wound was mortal, but the assassin quickly met his own doom, for a bullet from Musa's musket passed through his body, and the murderer fell dead beside his victim.

Musa added that the Doctor died instantly, and that, finding the Mafites were out, he ran back to the baggagemen, and told them that their master had been killed. The baggage was then abandoned, and the whole party sought safety by a hasty flight, which they continued till sunset, when they took refuge for the night in a jungle. The next day they returned to the scene of the disaster, and found Livingstone's body lying on the ground, naked but for the trousers, the rest of his clothing having been stolen. A hole was hastily "scratched" in the ground, and the explorer was buried. No papers or any other means of identification were recovered, and, broken-hearted at the loss of their beloved master, the Johanna men started for the coast, enduring great hardships by the way, but finally arriving safely in Zanzibar.

STICKING TO A LIE.

To this tale all the faithless servants adhered through one cross-examination after another, and it was very generally believed, until Sir Roderick Murchison, in a letter to the London *Times*, pointed out several flaws in the ingenious fabrication, proposing at the same time that an expedition should be sent to the western shores of Lake Nyassa to examine into the truth of the report. The English Government promptly seized this suggestion; volunteers were called for, and hundreds of brave men at once eagerly offered their services. Mr. Edward Daniel Young was selected to take command. In a trip extending over less than five months, the gallant officer completely proved the falsity of Musa's account, obtained trustworthy evidence of Livingstone's continued health and activity, and returned to England, where the news he brought was received with unbounded enthusiasm. The general public had followed with unflagging interest the fortunes of the celebrated explorer, had eagerly sought reports concerning him during his absence, and were now gratified with the assurance that he was alive.

Meanwhile, Livingstone, ignorant alike of the report of his death and of the efforts being made on his behalf, quietly reflects in his journal that he is not sorry to have got rid of the Johanna men—they were such inveterate thieves. Pressing on with his small retinue, now reduced to the surviving Nassick boys and the Shapunga and Ajawa men, Livingstone reached a village at the foot of Mount Mulundini, on the west of the heel of the Nyassa, and obtaining there confirmation of the reports of disturbances on the north, determined to go west amongst the Manganja, here called Maravi.

This resolution was attended with the best results. Courteously received at every village, and supplied with guides to the next, our hero passed safely through a beautiful, mountainous country, till he reached Chipanga, the most southerly point of his journey.

A HASTY RETREAT.

A short march westward from Chipanga brought the party to a village called Theresa, beyond which the course was north-easterly, and through districts hitherto totally unknown to Europeans. One river after another, flowing towards Lake Nyassa, was crossed, and all seemed likely to go well, when, one day, after a successful hunt, in which a fine hartebeest antelope was shot, came news from villagers flying southwards for their lives, that the Mazitu were out and close at hand ready to give battle. The servants, who were eagerly anticipating a hearty supper, such as rarely fell to their lot, started to their feet, the half-cooked meat was hastily packed, and Livingstone and his guide Mpanda set out to try and engage extra carriers to aid in the retreat.

As they approached the next village, however, the inhabitants poured out. The Mazitu were there too, and the terrified people were fleeing to the Zalanyama mountains, on the south-west. Mpanda and his men now wished to go home and look after their own property, but Livingstone managed to persuade them to remain, and follow with him the fugitives. Taking his stand at the foot of the rocky sides of the Zalanyama range, now crowded with trembling natives, our hero intended to defend his property to the last; but after waiting some time he heard that the enemy had gone to the south. Had he carried out his first scheme of going forward in search of men, he would have walked straight into the hands of the Mazitu, and his fate would probably have differed but little from that assigned to him in Musa's story.

As the journey westwards was pursued, the smoke of burning villages on the east and on the south plainly marked the course of the marauders, and, thankful for his narrow escape, Livingstone pressed on as rapidly as possible to the village of Mapino, beyond which he could only advance very slowly, as the country was thinly peopled, and food and water were scarce. The constant raids of marauders from the north, and the visits of Arab slave-traders from the south, had, moreover, rendered the natives suspicious and inhospitable, but, as in his previous journeys, Livingstone everywhere succeeded in overcoming the prejudice against white men, and convincing the poor down-trodden people that he meant them nothing but good.

The foot of Mount Chisia was reached, and a halt was made at a blacksmith's or founder's village, where Livingstone was interested in witnessing the primitive native mode of smelting iron, and was watching the erection of a furnace on an ant-hill, when the feeling of security was again dispelled by tidings of the approach of the Mazitu. They were already, said the messenger, at Chanyandula's village on the north, which was to have been the next halting-place. The headman of the village at once urged Livingstone to remain with him till it was certain which path the hated invaders would take, and the women were all sent away, whilst the men went on quietly with their usual occupations. No Mazitu came, but an elephant approached Livingstone's camp and "screamed at him," making off, however, at the shouting of the villagers. The largest of all animals has a wholesome dread of getting into danger.

The next morning the march was resumed, and at length a halt was made outside a stockaded village, where the people refused to admit our hero until the headman came and gave permission. This was a foretaste of many similar difficulties, but slowly, very slowly, step by step and inch by inch, the advance northwards continued, now broken by illness, now hindered by *detours* in search of the way and by severe fatigue. In December the banks of the Loangwa were sighted, and, unable to obtain food at the village on its eastern shores, Livingstone crossed the stream without a guide, and beyond it entered a pathless, bushy country, where the way had to be cut step by step by the almost fainting travelers.

THIEVES IN THE CAMP.

To give the merest outlines of the difficulties surmounted, the dangers escaped, and the privations endured as the gallant little band advanced further and further into the unknown interior, would be to fill a volume. We must content ourselves with stating that a climax appears to have been reached in January, 1867, when, after plodding on under heavy rains through a famine-stricken country, and crossing the river Chambeze, afterwards under its name of the Lualaba discovered to be of such vast importance, which comes down from the western slope of the plateau of the district of Lobisa, our hero was deserted by the two Ajawa men mentioned as having joined his party at Lake Nyassa. The loss of two carriers was bad enough, but, to complicate matters still further, they took with them the medicine box for the sake of the cloth, and some clothes belonging to a boy, called Baraka, in which were packed a quantity of flour, the tools, two guns, and a cartridge-pouch.

Livingstone, in relating the incident in his journal, remarks pathetically that the thieves would, of course, only throw away the valuable contents of the medicine box when they discovered their nature, adding that he felt as if he had now received the sentence of death.

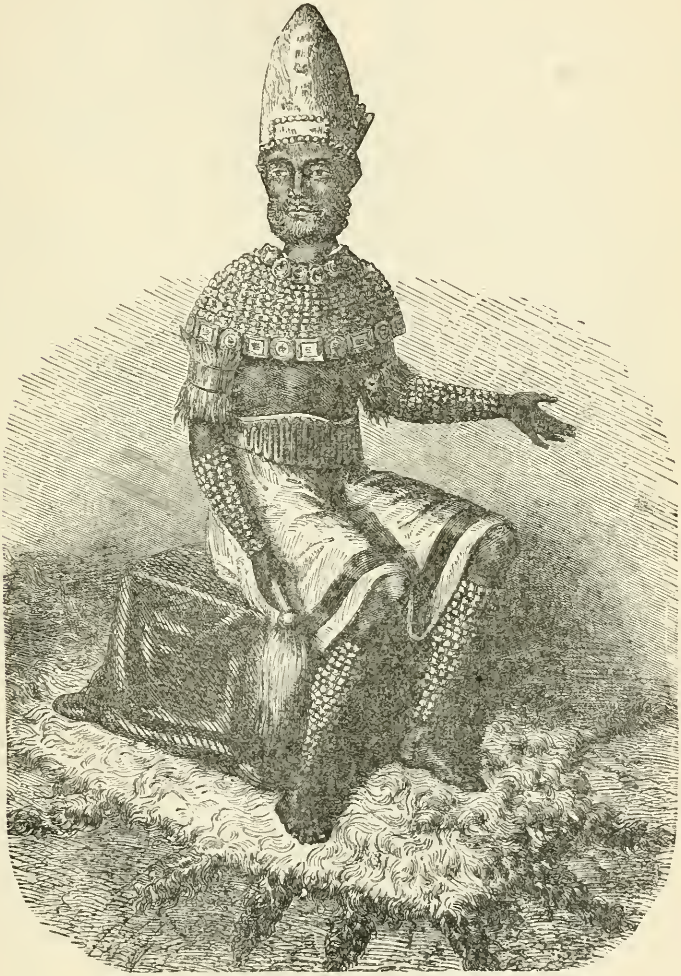
All attempts to catch the fugitives failed. Heavy rain obliterated every trace of their footsteps, and the forest was so dense and high that they easily concealed themselves and their booty. Unable now to procure daily bread, Livingstone commended himself and the few who still remained true to him to God, and struggled on by terribly slow stages through the sparsely inhabited Lobemba country to the important village of Chitapanga, where fresh supplies were obtained at a very heavy cost, and the expedition was saved from starvation.

After delaying our hero for three weeks in his village, and mulcting him considerably in beads and cloths, Chief Chitapanga finally consented to provide him with guides to take him to Lake Tanganyika, or, as its lower end is called, Lake Liemba, and, cheered by the prospect of soon reaching the end of the second stage of his great journey, Livingstone started, and, after an exhausting journey and terrible sufferings from fever, for which he had now no remedies, he came to the village of Mombo, near a ridge overlooking the lake, but he was too ill to enter it.

Compelled to halt almost within sight of the second goal of his wanderings, Livingstone heard his boys firing their guns in the distance, to celebrate their own approach to the long-sought lake. This was too much for him to bear unmoved, and, summoning all his remaining strength to his aid, he climbed the ridge, saw Lake Tanganyika lying peacefully beneath him, descended some 2000 feet, and finally stood upon the beach. To quote his own words, he was deeply thankful at having got so far, and though excessively weak, unable to walk without tottering, he adds his conviction that the Highest would lead him further and exercise over him a constant care.

SUSPICIOUS PEOPLE.

The waters appeared to be some eighteen or twenty miles broad, and he could see them for about thirty miles up to the north. A nearly perpendicular mountain ridge of perhaps 2000 feet high extends with occasional breaks all round, the lake reposing in a deep cup-shaped cavity. The people dwelling on its shores—a race called Balungu, who had suffered much at the hands of the notorious Mazitu—were suspicious of the strangers, and would not allow Livingstone to sound the lake, or reply to his inquiries respecting the course of the numerous rivers flowing into it. After a fortnight's rest amongst the lovely scenery of the southern shores of Lake Tanganyika, Livingstone was compelled to turn back owing to the disturbed state of the country, and all hope of proceeding further in this direction had to be abandoned. A day or two after his arrival at Cazembe, he was summoned to a grand reception by the chief, who received him seated before a gigantic hut, surrounded by a score of smaller huts for his attendants. He was attended by his principal wife, his executioner, and a number of "officers," many of the latter with cropped ears and one hand lopped off, telling of former disgrace.



CAZEMBE IN STATE DRESS.

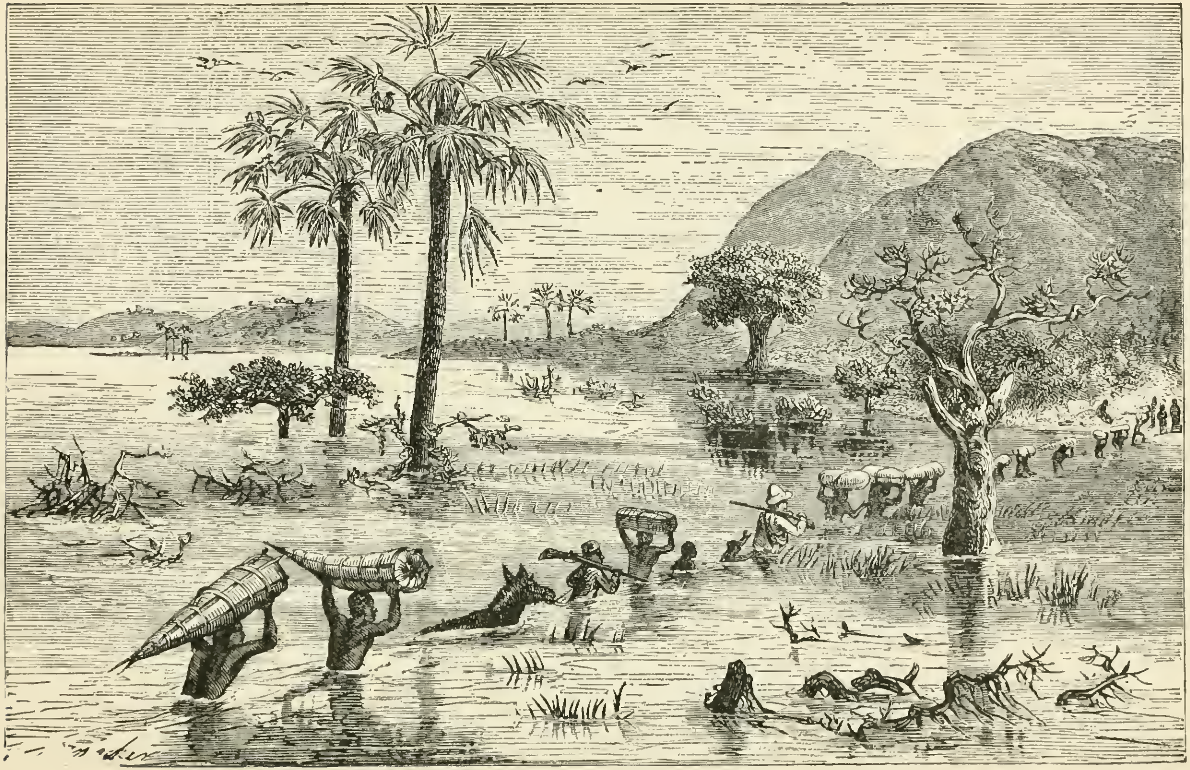
Cazembe was in a good mood, and was evidently pleased to receive a call from the white man and his attendants. The object of Livingstone's visit having been explained by an old native, minus both ears, the white man came forward and made his bow. Cazembe, who is described as a heavy, uninteresting-looking man, without the strict African type of countenance, then politely assured his guest that he was welcome to his country, to go where he liked and do what he chose, and after a few more formalities the conversation became general. Livingstone even ventured to say to the executioner, who had a curious scissors-like instrument at his neck for cropping ears, that his must be nasty work; at which sally "he smiled, and so did many who were not sure of their ears for a moment." Another laugh was raised when Livingstone, on being called upon to salute the queen, a tall good-featured lady, with two spears in her hand, involuntarily beckoned to her to come nearer.

Soon came a raid from devastating hords of Mazitu, who were repulsed by the united forces of the Arab traders and the native chiefs; then a quarrel between the successful allies, resulting in an attack, headed by Cazembe, on the Arabs. Confusion now prevailed everywhere. The daily entries in Livingstone's journals became impossible, but he writes how he and his little band of servants were on one occasion surrounded by a party of fifteen or twenty natives, who attacked them with spears and poisoned arrows; how "one good soul helped them away—a blessing be on him and his;" how he narrowly escaped from the hands of another chief, who took him and his men for Mazitu; and how, lastly, he joined forces with the Arab traders, and started north, fences being built every night to protect the united camps, which were, however, unmolested till the northern bank of the Kalongosi river was reached. Here five hundred natives were drawn up to dispute the passage, but as Livingstone and an advanced party with thirty guns crossed over they retired. Our hero, however, went amongst them, explained who he was, was recognized by some old acquaintances, and obtained a truce for the Arabs. All became friendly, an elephant was killed, stores of provisions were bought, and two days later the march was resumed.

A MOTLEY CARAVAN.

Having reached Ujiji, presently came rumors of vast herds of elephants in Manyuema, and of a sturdy race of blacks differing essentially from any of those yet met with. A horde of Arabs determined to go and test the truth of these reports, and though he knew that he would have to witness scenes of bloodshed which must sicken his very soul, Livingstone decided to go with them.

Our hero embarked once more upon the lake, accompanied by his own little retinue and a motley escort of Arabs, half-castes, and natives. Landing in the district of Guha, led by a guide, the whole party, after a slight *detour* to the south, started in a north-westerly direction over rivers often waist-deep, and among palmyra and hyphene palms, and many villages swarming with people.



THE EXPLORERS TRAVELING BY WATER.

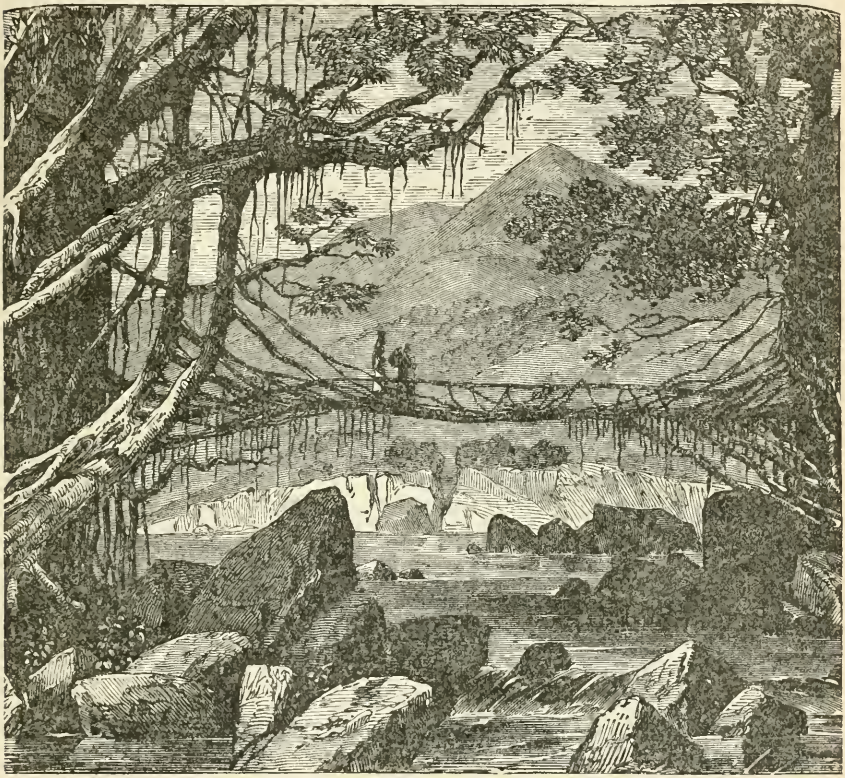
Here Livingstone records an elephant hunt (in which he was too weak to share, though the heart of a young elephant was presented to him by the Arabs), and the escape of a young slave for whom he had interceded to be freed from his yoke. The poor fellow was near his own land, and would be hidden, adds our hero; but the guide, who knew his plan, was eager to betray him for a reward.

On and on pressed the caravan, now up a broad range of mountains, now down a deep valley dotted with Manyuema houses built of clay and square in form, but Livingstone can hardly note the features of the country, for his heart is wrung by the proceedings of his companions. At one village he tells us how Dugumbe, a half-caste Arab trader of the party, after receiving every kindness and hospitality from the natives, seized ten goats and ten slaves, having four of his own men killed in revenge.

Proceeding nearly due north, through dense forests, across wilderness, and among villages and running rills, the paths often choked up by vegetation, the party at first advanced with considerable rapidity, the villagers, though uproarious from the excitement of never having seen strangers before, being perfectly civil. But presently the rainy season set in, constant wettings brought on a return of fever, the Arabs espoused the feuds of the chiefs through whose districts they passed, war and pillage, open murder, secret assassination, were the order of the day, and in June, 1869, all Livingstone's men except three, named Susi, Chumah, and Gardner, deserted him.

Having obtained a fresh batch of men, and started again for the long sought Lualaba, Livingstone notes in his journal the total absence of all law, might everywhere making right, and adds that he dreads a disturbance at the next village. He tells of crossing a tributary of the Lualaba, by a natural bridge, and lastly, of the arrival at the now famous Nyangwé, chief village of a district of the same name on the banks of a creek of the Lualaba itself. Again we are struck with the absence of all enthusiasm as the undaunted hero records his arrival at last on the banks of the great river. He went down, he says, to have a good look at it, and found it to be "at least three thousand yards broad, and always deep," adding, "it has many islands, and the current is about two miles an hour to the north." Not one word of triumph at the success achieved at the cost of so much labor and so much still more arduous waiting, only a few words of thankfulness that Abed, an Arab chief, who had pitched his camp outside Nyangwé, had said his (Livingstone's) "words against bloodshed had struck into him, and he had given orders to his people to give presents to the chiefs, but never fight unless actually attacked."

This was a little step in the right direction, but alas! it was rendered of no avail by the cruel and lawless proceedings of three men belonging to the retinue of the slaver Dugumbe. Livingstone had built himself a house at Nyangwé, and intended making it his headquarters for many a voyage of exploration up and down the Lualaba. He was only waiting for the canoes Abed had promised to procure for him, employing the time in making geographical notes, on old newspapers with ink made by himself from the seeds of a plant, his stores of writing materials being exhausted. He should now, he hoped, at last be able to ascertain from personal observation whence the Lualaba came, and whither it went; but once more he was foiled, and once more compelled to turn back on the very eve of success.



NATURAL BRIDGE OVER THE MOANGOI.

Here Livingstone gives the following terrible narrative of a scene witnessed by himself at Nyangwé, which shows the desperate character of the savages and their bloodthirsty spirit:

"It was a hot, sultry day, and when I went into the market I saw three of the men who had lately come with Dugumbe. I was surprised to see them with their guns, and felt inclined to reprove them, as one of my men did, for bringing weapons into the market, but I attributed it to their ignorance; and it being very hot, I was walking away to go out of the market, when I saw one of the fellows haggling about a fowl, and seizing hold of it. Before I had got thirty yards out, the discharge of two guns in the middle of the crowd told me that slaughter had begun; crowds dashed off from the place, and threw down their wares in confusion and ran. At the same time that the three opened fire on the mass of people near the upper end of the market-place, volleys were discharged from a party down the creek on the panic-stricken women, who dashed at the canoes. These, some fifty or more, were jammed in the creek, and the men forgot their paddles in the terror that seized all. The canoes were not to be got out, the creek being too small, for so many men and women wounded by the balls poured into them, and they leaped and scrambled into the water shrieking. A long line of heads in the river showed that great numbers struck out for an island a full mile off. Shot after shot continued to be fired on the helpless and perishing. Some of the long line of heads disappeared quietly; whilst other poor creatures threw their arms high, as if appealing to the great Father above. Dugumbe put people into one of the deserted vessels to save those in the water, and saved twenty-one; but one woman refused to be taken on board from thinking that she was to be made a captive.

"My first impulse," adds Livingstone, after relating this terrible massacre, "was to pistol the murderers," but Dugumbe protested against his getting into a blood-feud, and he was afterwards glad that he refrained, for it could have done no real good. Sick at heart, our hero felt he could no longer give the sanction of his presence to the murder of the innocent; he must make a protest of some kind, though the only one in his power involved his turning his back on the river it had taken him so many weary months to reach.

ESCAPE FROM THE THRUST OF A JAVELIN.

Collecting his own little retinue, Livingstone started on foot for Ujiji three days later, the Arabs trying to prove their penitence by pressing their goods upon him, begging him not to hesitate to tell them of anything he wanted. A little gunpowder was all he would accept, and, as he turned his back on the Lualaba, he tried to console himself with a hope that, with new men from Ujiji, he might yet penetrate to Rua, see the underground excavations of which the natives had told him in that kingdom, proceed thence to Katanga and the four ancient fountains beyond, and, finally, visit Lake Lincoln, the name he had given in honor of the murdered President of the United States to a sheet of water said to exist on the south-west of Kamolondo. We may add that Livingstone named the Loeki Young's River, after the leader of the first expedition sent out in search of him; and the Lualaba Webb's River, after an old friend of his own with whom he spent a great part of his brief holiday in England between his second and third journeys in Africa.

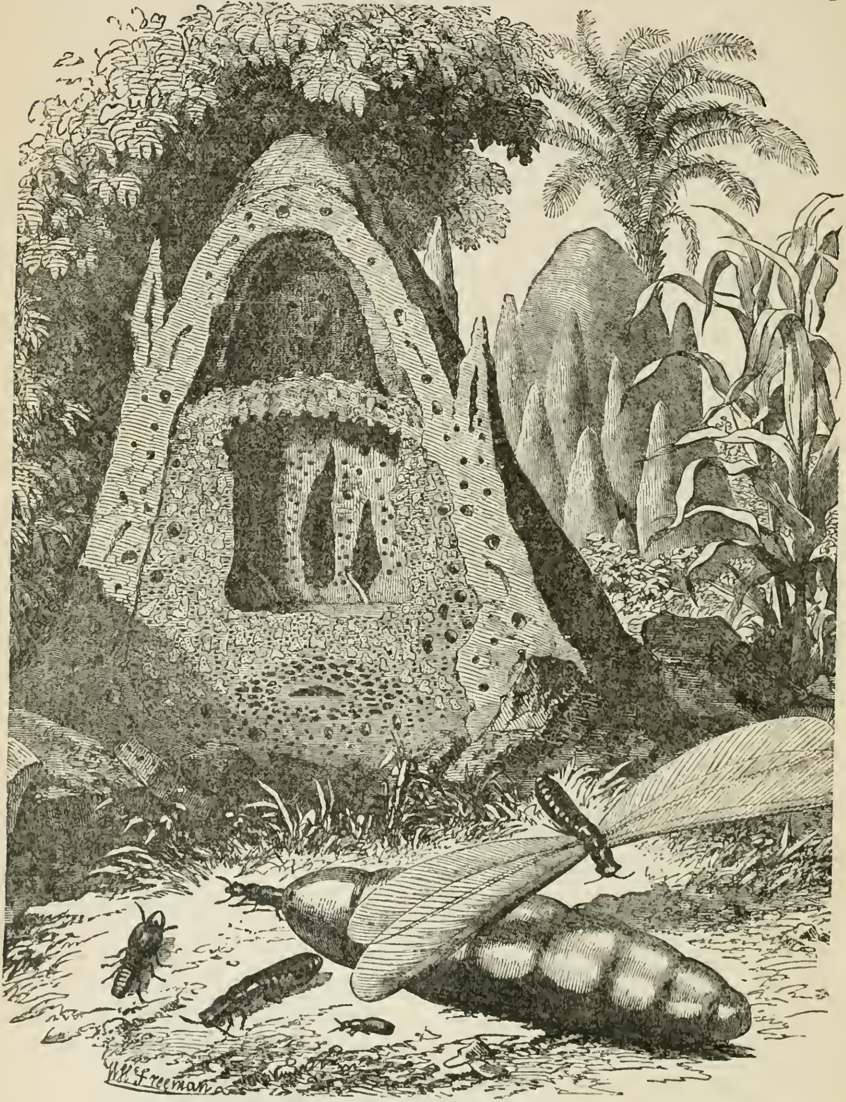
In the return march to Ujiji, Livingstone pressed on and passed miles of burning villages, until he came to a party of armed Manyuema, who refused to come near, threw stones at him and his men, and tried to kill those who went for water.

An attack being every moment expected, our hero attempted to come to a parley with his enemies, feeling sure that he could soon convince them of his friendly intentions, but they would not listen to his envoys, and in passing along a narrow path, with a wall of dense vegetation touching each hand, he came to a spot where trees had been cut down to obstruct his party whilst they were speared. Clambering over the barriers, though expecting instant death, Livingstone was surprised at meeting with no opposition, but as he crept slowly along, preceded by his men, who really seemed to have behaved very well, and peered up into the dense foliage on either side, a dark shadow, that of an infuriated savage, here and there intervened between him and the sun. Every rustle in the leaves might now mean a spear, any sound might be the signal for a massacre. Presently a large spear from the right almost grazed Livingstone's back, and stuck into the ground behind him. He looked round and saw two men from whom it came in an opening in the forest only ten yards off, but again his foes disappeared as if by magic and were quickly lost to sight.

MARVELOUS DELIVERANCES.

All were now allowed to go on for a few minutes unmolested, but soon another spear was thrown at Livingstone by an unseen assailant, missing him again by about a foot. A red jacket he wore, he tells us, led our hero to be taken for Mohammed Mogharib, one of the slave-dealers, and it soon became evident that his men were to be allowed to escape whilst the attack was concentrated upon him. Ordering his attendants to fire their guns into the bush—the first time, be it observed, that he had ever in the course of his long wanderings used weapons in his own defence—our hero still went calmly on, congratulating himself that no yells or screams of agony succeeded his volley, till he came to a part of the forest cleared for cultivation.

Here he noticed a gigantic tree, made still taller by growing on an ant-hill twenty feet high, to which fire had been applied near the roots. These ants construct their nests with covered galleries, and far surpass bees, wasps, or beavers in the art of building, and in sagacity and government. There are several species, and some build on the ground, others on the branches of trees, often at great heights. The largest species is best known on the coast of Africa. It erects immense buildings of well-attempered clay. In Senegal they resemble the villages of the natives, being ten or twelve feet above the level of the ground, and like very large haycocks. Comparing the size of the animal with that



WHITE ANTS AND THEIR DWELLINGS.

of man, these buildings are to the ants what four times the height of the Washington Monument would be to us.

Every building consists of two parts, an exterior dome and an interior, divided into an amazing number of apartments. The exterior is a protection from the weather, and in the interior reside the king and queen, and the whole community, with magazines stored with provisions and conveniences. They raise the immense structure in separate turrets, of the shape and size of sugar-loaves, and then fill it between till the dome is completed by joining the tops of the lofty turrets which they raise in the centre. They then take away the bases of the central turrets, and apply the clay to the construction of the interior.

The royal chamber is in the centre, in the shape of a large oven. The entrances are so small, that the king and queen can never leave it. Around it are apartments for soldiers and attendants, and magazines filled with gums and hardened juices of plants. Among these are the nurseries for the eggs and young. Beneath are sewers to carry off water, descending to the gravel ; here subterraneous passages are carried horizontally to vast distances, like passages from old castles, from which they emerge on any building or merchandise they intend to attack. As they cannot carry up perpendiculars, all the ascents and descents are made by spiral roads. For a communication inside they construct elliptical bridges.

The ravages of white ants are very destructive. In the island of St. Helena, the white ants were, it is supposed, accidentally introduced from the coast of Guinea. Jamestown was devastated, the cathedral and the books of the public library were destroyed. Everything in the town made of wood was more or less injured, imperilling the lives of large numbers of the four thousand inhabitants. In the government stores it was found that the moist traces of the insect on the outside of the tin cases caused very speedy corrosion of the metal, and enabled the insects to make their way in and devour the contents, doing immense damage.

As Livingstone came up to the tree he heard a crack which told that the destructive element had done its work, but he felt no fear till he saw the huge bulk falling forwards towards himself. He started back, and only just escaped being crushed. "Three times in one day," he remarks, "was I delivered from impending death." His attendants, gathering round him, and taking this third preservation as a good omen, shouted, "Peace! peace! you will finish your work in spite of these people, and in spite of everything."

Five hours more of "running the gauntlet" ensued, and then the little band emerged unscathed on the cleared lands of a group of villages, to be met by a friendly chief named Muanampanda, who invited them to be his guests. On learning the meaning of all the firing he had heard, Muanampanda offered to call his people together, and punish those who had molested the explorer, but, true to his generous character, Livingstone declared that he wished no revenge for an attack made in error, and with some little difficulty the chief consented to humor what must have seemed to him a strange whim, something so contrary to savage customs and savage nature.

At Muanampanda's, Livingstone had unmistakable proof of the practice of cannibalism amongst the Manyuema, who eat their foes killed in battle, not from any lack of other animal food, but with a view to inspiring themselves with courage. They are said to bury a body which is to be eaten, for two days in a forest, and then to disinter and cook it. We are glad to be able to add that they seem rather ashamed of this horrible practice, and do not like strangers to look at their human meat.

ARRIVAL OF THE YOUNG AMERICAN.

Another week and Livingstone chronicles his third arrival on the shores of Tanganyika, this time close to the entry into the lake of the river Logumba, which rises in the Kalogo mountains on the west. "Perhaps," hazards Livingstone, "this river is the outlet of Tanganyika. Great noises as of thunder were heard as far as twelve days off, which were ascribed to Kalogo, as if it had subterranean caves into which the waves rushed with great noise; the country slopes that way," he adds, "but I was too ill to examine its source."

In October the worn-out, almost dying, explorer arrived on the islet of Kasenge, landed on the eastern shores of the lake, and entered Ujiji, reduced, to use his own words, "to a skeleton." Warmly welcomed by the Arabs, who had believed him to be dead, and finding the market full of all kinds of native provisions, he hoped that proper food and rest would soon restore him, but in the evening his people came to tell him that the goods he had left under the care of a man named Shereef had been sold at a nominal price, the Arabs adding that they protested, but the "idiot" would not listen to them.

"This was distressing," exclaims poor Livingstone, thus again cut off from hope of fresh explorations. "I had made up my mind, if I could not get people at Ujiji, to wait till men should come from the coast, but to wait in beggary was what I never contemplated." The man Shereef actually came without shame to shake hands with his old master, and on Livingstone's refusing him that courtesy he assumed an air of displeasure, as if he had been badly treated, observing on leaving, "I am going to pray," and acted as if he expected to be congratulated for appropriating goods that were not his own.

In his destitution Livingstone felt, he tells us, as if "he were the man who went down from Jerusalem to Jericho, and fell among thieves," but for him there was no hope of priest, Levite, or good Samaritan. Never, however, was the oft-quoted proverb, "When things are at the worst they will mend," more thoroughly verified than in this instance. First came a generous offer of aid in the form of a stock of valuable ivory from an Arab named Syed bin Magid, and then the news brought by Susi of the approach of an "Englishman," who turned out to be the celebrated young American, Henry Morton Stanley, sent out to the relief of Livingstone by Mr. Bennett, proprietor of the *New York Herald.*

Livingstone's astonishment and delight will be readily imagined at this unexpected appearance on the scene of a man bringing not only news from home, for which the exile longed so intensely, but stores of goods, including tin baths, huge kettles, cooking pots and tents. The tidings brought by Stanley "made his whole frame thrill;" for two long years he had heard nothing, and now he was to learn of the Franco-Prussian war, the laying of the Atlantic cable, and many other notable events. During the long period of his voluntary exile he had often wondered what was transpiring in the world from which he was separated, yet he was so devoted to his object of making new discoveries in the dark land where so many years of his life had already been spent, that he was willing to undergo all deprivations, hardships and sufferings to attain the great end he had in view. Most men would have been turned back by the obstacles which lay in his path, but perseverance was one of the chief characteristics of Livingstone, and he sacrificed himself in his undertaking.

CHAPTER III.

TRAVELS OF STANLEY IN THE TROPICS.

Expedition in Search of Livingstone—Getting Ready for the Start—A Sultan's Curious Palace—Incidents of Travel—Crossing the Turbid Kingani—Hippopotami—A Tropical Garden—Adventures of the Chase—African Beauties—Tidings of Livingstone—Punishing a Runaway—Excitement at Ugogo—Stanley Resists Extortion—The Arabs and Their War—Mirambo—Ammonia and Laughter—A Formidable Donkey—Arrival at Ujiji and Success of the Expedition.

EARLY in January, 1871, Henry Morton Stanley landed in Zanzibar, on the eastern coast of Africa. For two years the great explorer, Livingstone, had been lost to the world, and no tidings had been received from him. There were rumors of his death in Central Africa, but grave suspicions of their truth were entertained by those who had the opportunity to be best informed.

The task given to Mr. Stanley was to plunge into the unknown wilds of the "dark Continent," and find Livingstone, either alive or dead. His travels are among the most remarkable ever related, and have proved him to be an explorer second to none who ever turned their attention to this part of the globe.

An insuperable obstacle to rapid transit in Africa is the want of carriers, and as speed was the main object of the expedition, the concern was to lessen this difficulty as much as possible. Carriers could only be engaged after arriving at Bagamoyo, on the mainland. Over twenty good donkeys were wanted, also a cart adapted for the footpaths of Africa. Accordingly a cart was constructed, eighteen inches wide and five feet long, supplied with two fore-wheels of a light American wagon, more for the purpose of conveying the narrow ammunition-boxes. It was estimated that if a donkey could carry to Unyanyembe a load of four frasilahs, or one hundred and forty pounds, he ought to be able to draw eight frasilahs on such a cart, which would be equal to the carrying capacity of four stout pagazis or carriers. Events will prove how these theories were borne out by practice. The purchases were completed and piled up, tier after tier, row upon row, here a mass of cooking-utensils, there bundles of rope, tents, saddles, a pile of portmanteaus and boxes, containing every imaginable thing. There were at least six tons of material, all of which would be required in the long journey. The traveler must needs make his way into the African interior after a fashion very different from that to which he has been accustomed in other countries. He requires to take with him just what a ship must have when about to sail on a long voyage. He must have his little store of canned dainties, and his medicines, besides which, he must have enough guns, powder, and ball to be able to make a series of good fights if necessary. He must have men to convey these miscellaneous articles; and as a man's maximum load does not exceed seventy pounds, to convey eleven thousand pounds requires nearly one hundred and sixty men. Europe and the Orient, even Arabia and Turkestan, have royal ways of traveling compared to Africa. Specie is received in all those countries, by which a traveler may carry his means about with him on his own person. Eastern and Central Africa, however, demand a necklace, instead of a cent; two yards of American sheeting, instead of half a dollar, or a florin, and a kitindi of thick brass-wire, in place of a gold piece. The African traveler can hire neither wagons nor camels, neither horses nor mules, to proceed with him into the interior. His means of conveyance are limited to black men, who want fifteen dollars a head for every seventy pounds weight carried only as far as Unyanyembe.

THE EXPEDITION CREATES A SENSATION.

The fact that a white man, even an American, was about to enter Africa was soon known all over Zanzibar. It was repeated a thousand times in the streets, proclaimed in all shop alcoves, and at the custom-house. The native bazaar laid hold of it, and agitated it day and night until the departure. The foreigners, including the Europeans, wished to know everything pertaining to the expedition. Says Stanley: "My answer to all questions, pertinent and impertinent, was, 'I am going to Africa.' Though my card bore the words 'HENRY M. STANLEY, *New York Herald*,' very few, I believe, ever coupled the words 'New York Herald' with a search after Doctor Livingstone. It was not my fault, was it? They were at liberty to form their own conjectures.

"Ah, me! what hard work it is to start an expedition alone! What with hurrying through the baking heat of the fierce relentless sun from shop to shop, strengthening myself with far-reaching and enduring patience for the haggling contests with tradesmen, summoning courage and wit to brow-beat the villainous Goanese, correcting estimates, making up accounts, superintending the delivery of purchased articles, measuring and weighing them, to see that everything was of full measure and weight, overseeing the white men, Farquhar and Shaw, who were busy on donkey saddles, sails, tents, and boats for the expedition, I felt, when the day was over, as though limbs and brain well deserved their rest. Such labors were mine unremittingly for a month and wearied me. Having bartered drafts on Mr. James Gordon Bennett to the amount of several thousands dollars for cloth, beads, wire, donkeys, and a thousand necessaries, having advanced pay to the white men, and black escort of the expedition, there was nothing further to do but to leave my formal adieus with the Europeans, and thank the Sultan and those gentlemen who had assisted me, before embarking for Bagamoyo.

"The day before my departure from Zanzibar the American Consul, having just habited himself in his black coat, and taking with him an extra black hat, in order to be in state apparel, proceeded with me to the Sultan's palace. The prince had been generous to me; he had presented me with an Arab horse, had furnished me with letters of introduction to his agents, his chief men, and representatives in the interior, and in many other ways had shown himself well disposed towards me."

A CORAL PALACE.

The palace is a large roomy, lofty, square house close to the fort, built of coral, and plastered thickly with lime mortar. In appearance it is half Arabic and half Italian. The shutters are Venetian blinds painted a vivid green, and presenting a striking contrast to the whitewashed walls. Before the great, lofty, wide door were ranged in two crescents several Baluch and Persian mercenaries, armed with curved swords and targes of Rhinoceros hide. Their dress consisted of a muddy-white cotton shirt, reaching to the ankles, girdled with a leather belt thickly studded with silver bosses.

As the visitors came in sight a signal was passed to some person inside the entrance. When within twenty yards of the door, the Sultan, who was standing waiting, came down the steps, and, passing through the ranks, advanced toward them, with his right hand stretched out, and a genial smile of welcome on his face. They raised their hats, and shook hands with him, after which, doing according as he bade them, they passed forward, and arrived on the highest step near the entrance door. He pointed forward; they bowed and arrived at the foot of an unpainted and narrow staircase to turn once more to the Sultan. The Consul was ascending sideways, a mode of slow progression which was intended for a compromise with decency and dignity. At the top of the stairs the visitors waited, with their faces towards the up-coming Prince. Again they were waved magnanimously forward, for before them was the reception-hall and throne-room. The room was high, and painted in the Arabic style; the carpet was thick and of Persian fabric; the furniture consisted of a dozen gilt chairs and a chandelier. The Sultan sat in a gilt chair between the Americans and the counselors. Johari the dragoman stood humbly before the Sultan, expectant and ready to interpret what they had to communicate to the Prince.

The Sultan, so far as dress goes, might be taken for an ordinary gentleman, excepting, indeed, for the turban, whose ample folds in alternate colors of red, yellow, brown, and white, encircled his head. His long robe was of dark cloth, cinctured round the waist with his rich sword-belt, from which was suspended a gold-hilted scimitar, encased in a scabbard also enriched with gold. His legs and feet were bare, and had a ponderous look about them, since he suffered from that strange curse of Zanzibar—elephantiasis. His feet were slipped into a pair of slippers with thick soles and a strong leathern band over the instep. His light complexion and his correct features, which are intelligent and regular, bespeak the Arab patrician. They indicate, however, nothing except his high descent and blood; no traits of character are visible, unless there is just a trace of amiability, and perfect contentment with himself and all around.

Coffee was served in cups supported by golden finjans, also some cocoanut milk, and rich, sweet sherbet. Having answered all questions to his highness' satisfaction, he handed the explorer letters of introduction to his officers at Bagamoyo and Kable, and a general introductory letter to all Arab merchants who might be met on the road, and concluded his remarks with the expressed hope that the mission would be perfectly successful.

UNEXPECTED MISHAPS.

The expedition left Bagamoyo, the attraction of all the curious, with much *éclat*, and defiled up a narrow lane shaded almost to twilight by the dense umbrage of two parallel hedges of mimosas. All were in the highest spirits. The soldiers sang, the guide lifted his voice into a loud bellowing note, and fluttered the American flag, which told all on-lookers, "Lo, a white man's caravan!"

This first, or little journey of a few miles, was performed very well, "considering." The boy, Selim, upset the cart not more than three times. Zaidi, the soldier, only once let his donkey, which carried one bag of clothes and a box of ammunition, lie in a puddle of black water. The clothes had to be re-washed; the ammunition box, thanks to forethought, was water-proof. Kamna, one of the men, perhaps knew the art of donkey-driving, but, overjoyful at the departure, had sung himself into oblivion of the difficulties with which an animal of the pure asinine breed has naturally to contend against, such as not knowing the right road, and inability to resist the temptation of straying into the depths of an adjoining field; and the donkey, ignorant of the custom in vogue among drivers of flourishing sticks before an animal's nose, and misunderstanding the direction in which he was required to go, ran off at full speed along an opposite road, until his pack got unbalanced, and he was fain to come to the earth. But these incidents were trivial, of no importance, and natural to the first "little journey" in East Africa. They were such as were likely to befall all travelers.

The saddles were excellent, surpassing expectation. The strong hemp canvas bore its one hundred and fifty pounds burden with the strength of bull hide, and the loading and unloading of miscellaneous baggage was performed with systematic dispatch. In brief, there was nothing to regret—the success of the journey proved the departure to be anything but premature. The next three days were employed in putting the finishing touches to the preparations for the long land journey.

A THRIFTY WIDOW.

Shamba Gonera, the first camp, means Gonera's Field. Gonera is a wealthy Indian widow, well disposed towards the Wasungu (whites). She exports much cloth, beads, and wire into the far interior, and imports in return much ivory. Her house is after the model of the town houses, with long, sloping roof, and projecting eaves, affording a cool shade, under which the porters love to loiter. On its southern and eastern side stretch the cultivated fields which supply Bagamoyo with the staple grain, matama, of East Africa; on the left grow Indian corn, and muhogo, a yam-like root of whitish color, called by some manioc; when dry, it is ground and compounded into cakes similar to army slapjacks. On the north, just behind the house, winds a black quagmire, a sinuous hollow, which in its deepest parts always contains water—the muddy home of the brake-and-rush-loving "kiboko," or hippopotamus. Its banks, crowded with dwarf fan-palm, tall water-reeds, acacias, and tiger-grass, afford shelter to numerous aquatic birds.

The road was a mere footpath, and led over a soil, which, though sandy, was of surprising fertility, producing grain and vegetables a hundredfold, the sowing and planting of which was done in the most unskillful manner. In their fields, at heedless labor, were men and women in the scantiest costumes. The explorers passed them with serious faces, while they laughed and giggled, and pointed their index fingers at this and that, which to them seemed so strange.

A LUXURIANT VALLEY.

Soon the travelers had left the tall matama and fields of water-melons, cucumbers, and manioc; and, crossing a reedy slough, were in an open forest of ebony and calabash. In its depths are deer in plentiful numbers, and at night it is visited by the hippopotami of the Kingani for the sake of its grass. In another hour they had emerged from the woods, and were looking down upon the broad valley of the Kingani, stretching four miles east and west, and about eight miles north and south, left with the richest soil to its own wild growth of grass—which in civilization would have been a most valuable meadow for the rearing of cattle—invested as it was by dense forests, darkening the horizon at all points of the compass, and folded in by three-clad ridges.

At the sound of the caravan the red antelope bounded away to the right and left, and frogs hushed their croak. The sun shone hot with real African fervor. About half way across was a sluice of stagnant water which, directly in the road of the caravan, had settled down into an oozy pond. The porters crossed a hastily constructed bridge, thrown up a long time ago by some Washensi Samaritans. It was an extraordinary affair; rugged tree limbs resting on very unsteady forked piles, and it had evidently tested the patience of many a loaded caravan. Our weaker animals were unloaded, but this did not occasion much delay; the men worked smartly under supervision.

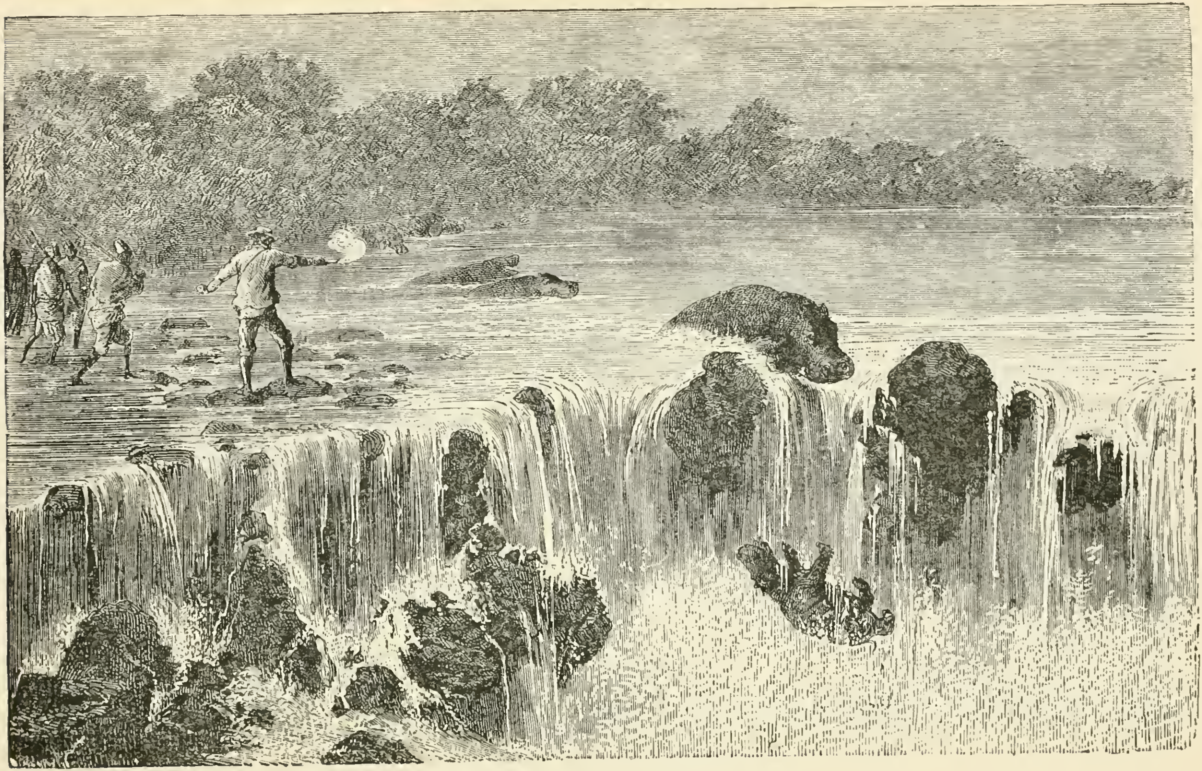
BUILDING A BRIDGE AND SHOOTING AT HIPPOPOTAMI.

The turbid Kingani, famous for its hippopotami, was reached in a short time, and the explorers began to thread the jungle along its right bank until they were halted point-blank by a narrow sluice having an immeasurable depth of black mud. The difficulty presented by this was very grave, though its breadth was barely eight feet; the donkeys, and, least of all, the horses, could not be made to traverse two poles like the biped carriers, neither could they be driven into the sluice, where they would quickly founder. The only available way of crossing it in safety was by means of a bridge, to endure in this conservative land for generations as the handiwork of the Wasungu. So they set to work with American axes—the first of their kind the strokes of which ever rang in this part of the world—to build a bridge. It was made quickly, for where the civilized white is found, a difficulty must vanish. The bridge was composed of six stout trees thrown across, over these were laid crosswise fifteen pack saddles, covered again with a thick layer of grass. All the animals crossed it safely, and then for a third time that morning the process of wading was performed. The Kingani flowed northerly here, and the course lay down its right bank. A half mile in that direction through a jungle of giant reeds and extravagant climbers brought them to the ferry, where the animals had to be again unloaded. Says Stanley: "Verily, I wished when I saw its deep muddy waters that I possessed the power of Moses with his magic rod, or what would have answered my purpose as well, Aladdin's ring, for then I could have found myself and party on the opposite side without further trouble; but not having either of these gifts I issued orders for an immediate crossing, for it was ill wishing sublime things before this most mundane prospect."

Kingere, the canoe paddler, espying the explorers from his brake covert, on the opposite side, civilly responded to their halloos, and brought his huge hollowed tree skillfully over the whirling eddies of the river to where they stood waiting for him. While one party loaded the canoe with goods, others got ready a long rope to fasten around the animals' necks, wherewith to haul them through the river to the other bank. After seeing the work properly commenced, Stanley amused himself with the hippopotami by peppering their thick skulls, which did no more than slightly tap them, causing about as much injury as a a boy's sling; it was perfect accuracy of firing, for ten times in succession the bullets struck the tops of their heads between the ears. One old fellow, with the look of a sage, was tapped close to the right ear by one of these bullets. Instead of submerging himself as others had done he coolly turned round his head as if to ask, "Why this waste of valuable cartridges on us?" The response to the mute inquiry of his sageship was an ounce-and-a-quarter bullet from the smooth-bore, which made him bellow with pain, and in a few moments he rose up again, tumbling in his death agonies. As his groans were so piteous, the sportsman refrained from a useless sacrifice of life, and left the amphibious horde in peace. A little knowledge concerning these uncouth inmates of the African waters was gained even during the few minutes of necessary delay at the ferry. When undisturbed by foreign sounds, they congregate in shallow water on the sand bars, with the fore half of their bodies exposed to the warm sunshine, and are in appearance, when thus somnolently reposing, very like a herd of enormous swine. When startled by the noise of an intruder, they plunge hastily into the depths, lashing the waters into a yellowish foam, and scatter themselves below the surface, when presently the heads of a few re-appear, snorting the water from their nostrils, to take a fresh breath and a cautious scrutiny around them; when thus, you see but their ears, forehead, eyes, and nostrils, and as they hastily submerge again it requires a steady wrist and a quick hand to shoot them.

At night they seek the shore, and wander several miles over the country, luxuriating among its rank grasses. To within four miles of the town of Bagamoyo (the Kingani is eight miles distant) their wide tracks are seen. Frequently, if not disturbed by the startling human voice, they make a raid on the rich corn-stalks of the native cultivators, and a dozen of them will, in a few minutes, make a frightful havoc in a large field of this plant. Consequently you may hear the owners of the grain venting loud halloos, like the farmer boys in our own country when scaring the crows away from the young corn. They are compelled to be constantly on the alert to protect their property.

Excepting in the neighborhood of the villages there are no traces of cultivation. The country extending between the several stations is as

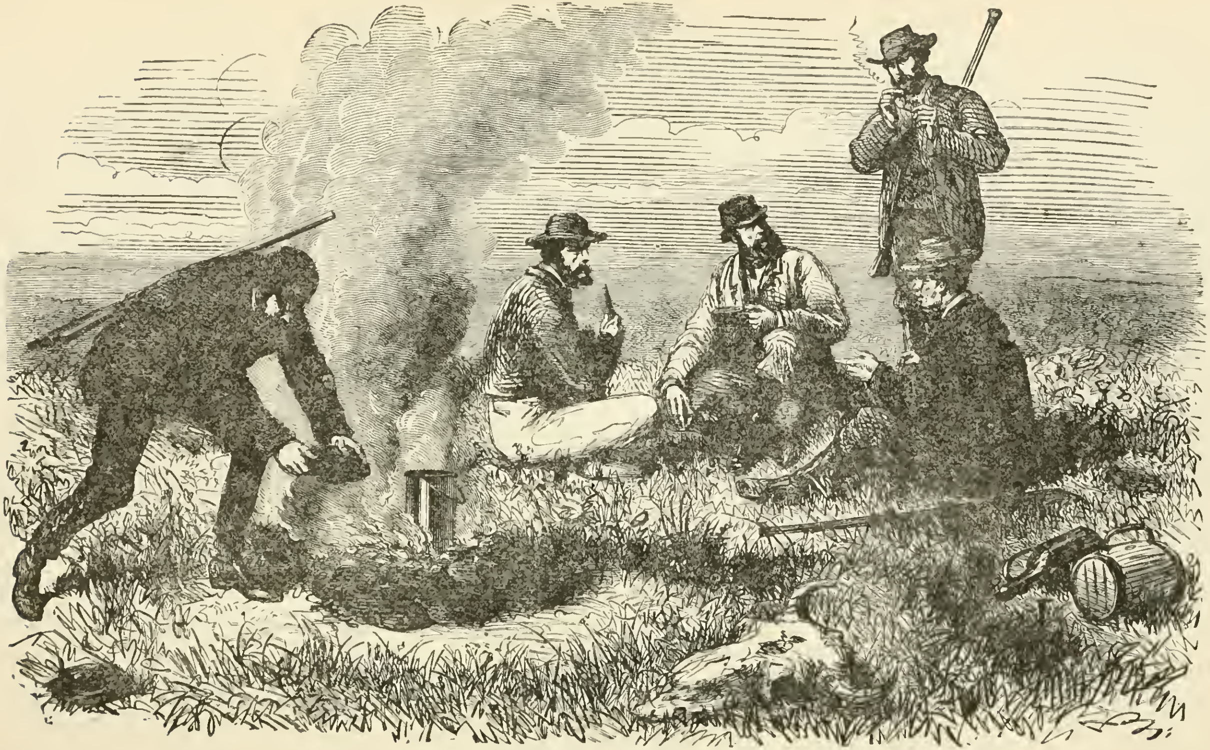


STANLEY SHOOTING HIPPOPOTAMI.

much a wilderness as the desert of Sahara, though it possesses a far more pleasing aspect. Indeed, had the first man at the time of the creation gazed at his world and perceived it of the beauty which belongs to this part of Africa, he would have had no cause of complaint. In the deep thickets, set like islets amid a sea of grassy verdure, he would have found shelter from the noonday heat, and a safe retirement for himself and spouse during the lonesome darkness. In the morning he could have walked forth on the sloping sward, enjoyed its freshness, and performed his ablutions in one of the many small streams flowing at its foot. His garden of fruit-trees is all that is required; the noble forests, deep and cool, are round about him, and in their shade walk as many animals as one can desire. For days and days let a man walk in any direction, north, south, east, and west, and he will behold the same scene of surpassing fertility and loveliness.

A HUNTING EXCURSION.

Mr. Stanley thus pleasantly describes one of his hunting experiences: Pending the arrival of the caravan, I sought the pleasures of the chase. I was but a tyro in hunting, I confess, though I had shot a little on the plains of America and Persia; yet I considered myself a fair shot, and on game ground, and within a reasonable proximity to game, I doubted not but I could bring some to camp. After a march of a mile through the tall grass of the opening, we gained the glades between the jungles. Unsuccessful here, after ever so much prying into fine hiding-places and lurking corners, I struck a trail well traversed by small antelope and hartebeest, which we followed. It led me into a jungle, and down a water-course bisecting it; but, after following it for an hour, I lost it, and, in endeavoring to retrace it, lost my way. However, my pocket-compass stood me in good stead; and by it I steered for the open plain, in the centre of which stood the camp. But it was terribly hard work —this of plunging through an African jungle, ruinous to clothes, and trying to the cuticle. In order to travel quickly, I had donned a pair of flannel trousers, and my feet were encased in canvas shoes. As might be expected, before I had gone a few paces a branch of the *acacia horrida*—only one of a hundred such annoyances—caught the right leg of my trousers at the knee, and ripped it almost clean off; succeeding which a stumpy thorn caught me by the shoulder, and another rip was the inevitable consequence. A few yards further on, a prickly aloetic plant disfigured by a wide tear the other leg of my trousers, and almost immediately I tripped against a convolvulus strong as ratline, and was made to measure my length on a bed of thorns. It was on all fours, like a hound on a scent, that I was compelled to travel; my solar topee getting the worse for wear every minute; my skin getting more



A BUCK HUNT IN A SOUTH AFRICAN COLONY—REST AFTER THE CHASE.

and more wounded; my clothes at each step becoming more and more tattered. Besides these discomforts, there was a pungent, acrid plant, which, apart from its strong, odorous emissions, struck me smartly on the face, leaving a burning effect similar to cayenne; and the atmosphere, pent in by the density of the jungle, was hot and stifling, and the perspiration transuded through every pore, making my flannel tatters feel as if I had been through a shower. When I had finally regained the plain, and could breathe free, I mentally vowed that the penetralia of an African jungle should not be visited by me again, save under most urgent necessity.

AFRICAN BELLES.

One of the halting-places was Kisemo, a village situated in a populous district, having in its vicinity no less than five other villages, each fortified by stakes and thorny abattis, with as much fierce independence as if their petty lords were so many Percys and Douglasses. Each topped a ridge, or a low hummock, with an assumption of defiance. Between these humble eminences and low ridges of land wind narrow vales which are favored with the cultivation of matama and Indian corn. The belles of Kisemo are noted for their vanity in brass wire, which is wound in spiral rings round their wrists and ankles, and the varieties of styles which their hispid heads exhibit; while their poor lords, obliged to be contented with dingy torn rags and split ears, show what wide sway Asmodeus holds over this terrestrial sphere—for it must have been an unhappy time when the hard-besieged husbands finally gave way before their spouses. Besides these brassy ornaments on their extremities, and the various hair-dressing styles, the women of Kisemo frequently wear lengthy necklaces, which run in rivers of colors down their bodies. A more comical picture is seldom presented than that of one of these highly-dressed females engaged in the homely and necessary task of grinding corn for herself and family. The grinding apparatus consists of two portions: one, a thick pole of hard wood about six feet long, answering for a pestle; the other, a capacious wooden mortar, three feet in height.

PUNISHING A THIEF.

At one point in the journey, one of Stanley's men, Khamisi, disappeared, and certain valuables with him. Uledi and Ferajji, who had been dispatched after the truant, soon returned with him and all the missing articles. Khamisi, soon after leaving the road and plunging into the jungle, where he was mentally triumphing in his booty, was met by some of the plundering Washensi, who are always on the *qui vive* for stragglers, and unceremoniously taken to their village in the woods, and bound to a tree preparatory to being killed. Khamisi said that he asked them why they tied him up, to which they answered, that they were about to kill him, because he was a Mgwana, whom they were accustomed to kill as soon as they were caught. But Uledi and Ferajji shortly after coming upon the scene, both well armed, put an end to the debates upon Khamisi's fate, by claiming him as an absconding porter from the Musungu's camp, as well as all the articles he possessed at the time of capture. The robbers did not dispute the claim for the porter, goats, tent, or any other valuable found with him, but intimated that they deserved a reward for apprehending him. The demand being considered just, a reward to the extent of eight yards of cloth and a fundo, or ten necklaces of beads, was given.

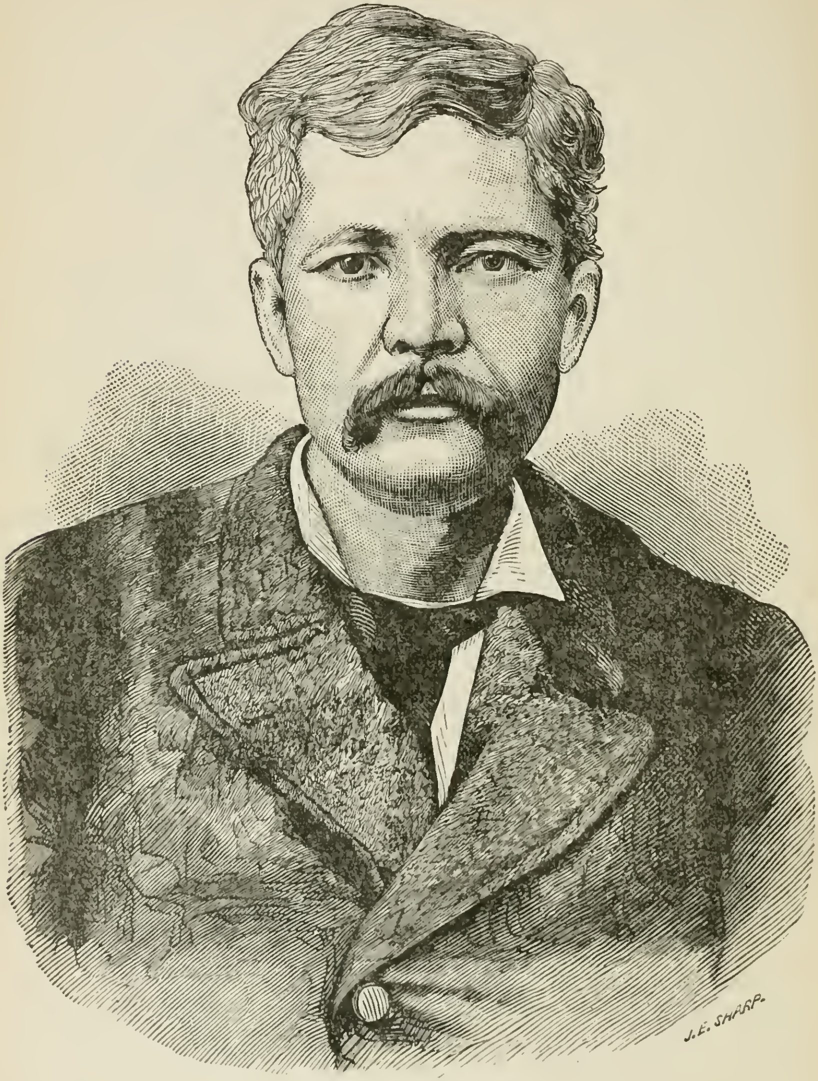
Khamisi, for his desertion and attempted robbery, could not be pardoned without first suffering punishment. He had asked at Bagamoyo, before enlisting in the service, an advance of five dollars in money, and had received it; and a load of Bubu beads, no heavier than a porter's load, had been given him to carry; he had, therefore, no excuse for desertion. Lest prudence should be overstepped, however, in punishing him, a court of eight porters and four soldiers was convened to sit in judgment, and asked to give their decision as to what should be done. Their unanimous verdict was that he was guilty of a crime almost unknown among the native porters, and as it was likely to give bad repute to the carriers, they therefore sentenced him to be flogged with the "Great Master's" donkey whip, which was accordingly carried out, to poor Khamisi's crying sorrow.

NEWS OF LIVINGSTONE.

At Muhalleh Stanley met Salim bin Rashid, bound eastward, with a huge caravan carrying three hundred ivory tusks. This good Arab, besides welcoming the new comer with a present of rice, gave him news of Livingstone. He had met the old traveler at Ujiji, had lived in the next hut to him for two weeks, described him as looking old, with long gray moustaches and beard, just recovered from severe illness, looking very wan; when fully recovered Livingstone intended to visit a country called Manyema by way of Marungu.

Stanley thus describes the annoyances met with in one part of his march through this wild region:

We quit our camp, where so much anxiety of mind and fretfulness had been suffered, not heeding a furious rain, which, after drenching us all night, might have somewhat damped our ardor for the march under other circumstances. The road for the first mile led over reddish ground, and was drained by gentle slopes falling east and west; but, leaving the cover of the friendly woods, on whose eastern margin we had experienced many discomforts, we cheered ourselves with the reflection that all our difficulties would finally be passed. We were not destined, however, to realize any such good fortune immediately; and here it may as well be said that the traveler in Africa will always be met by unexpected obstacles, will propose one thing and be compelled to do another, and just when he imagines the path is clear before him, he may meet with disappointment. From the woods where we



HENRY M. STANLEY.

had been delayed so long, we emerged into one of the savannahs, whose soil during the rain is as soft as slush and tenacious as thick mortar, where we were all threatened with the fate of the famous Arkansas traveler, who had sunk so low in one of the many quagmires in Arkansas county, that nothing but his tall "stove-pipe" hat was left visible.

Shaw, one of the white men, was sick, and the whole duty of driving the foundering caravan devolved upon myself. The donkeys stuck in the mire as if they were rooted to it. As fast as one was flogged from his stubborn position, prone to the depths fell another, giving me a Sisyphean labor, which was maddening under pelting rain, assisted by such men as Bombay and Uledi, who could not for a whole skin's sake stomach the storm and mire. Two hours of such a task enabled me to drag my caravan over a savannah one mile and a half broad; and barely had I finished congratulating myself over my success before I was halted by a deep ditch, which, filled with rain-water from the inundated savannahs, had become a considerable stream, breast-deep, flowing swiftly into the Makata. Donkeys had to be unloaded, led through a torrent, and loaded again on the other bank—an operation which consumed a full hour.

Presently, after straggling through a wood clump, barring our progress was another stream, swollen into a river. The bridge being swept away, we were obliged to swim and float our baggage over, which delayed us two hours more. Leaving this second river-bank, we splashed, waded, occasionally half-swimming, and reeled through mire, water-dripping grass and matama stalks, along the left bank of the Makata proper, until further progress was effectually prevented for that day by a deep bend of the river, which we should be obliged to cross the next day. Though but six miles were traversed during that miserable day, the march occupied ten hours. Half dead with fatigue, I yet could feel thankful that it was not accompanied by fever, which it seemed a miracle to avoid; for if ever a district was cursed with the ague, the Makata wilderness ranks foremost of those afflicted. Surely the sight of the dripping woods enveloped in opaque mist, of the inundated country with lengthy swathes of tiger-grass laid low by the turbid flood, of mounds of decaying trees and canes, of the swollen river and the weeping sky, was enough to engender the ague.

CAPTURING A DESERTER.

One of the soldiers engaged at Bagamoyo, named Kingaru, improved this opportunity to desert. The two detectives, Uledi and Sarmean, were immediately dispatched in pursuit, both being armed with American breech-loaders. They went about their task with an adroitness and celerity which augured well for their success. In an hour they returned with the runaway, having found him hidden in the house of a chief called Kigondo, who had accompanied Uledi and Sarmean to receive his reward, and render an account of the incident.

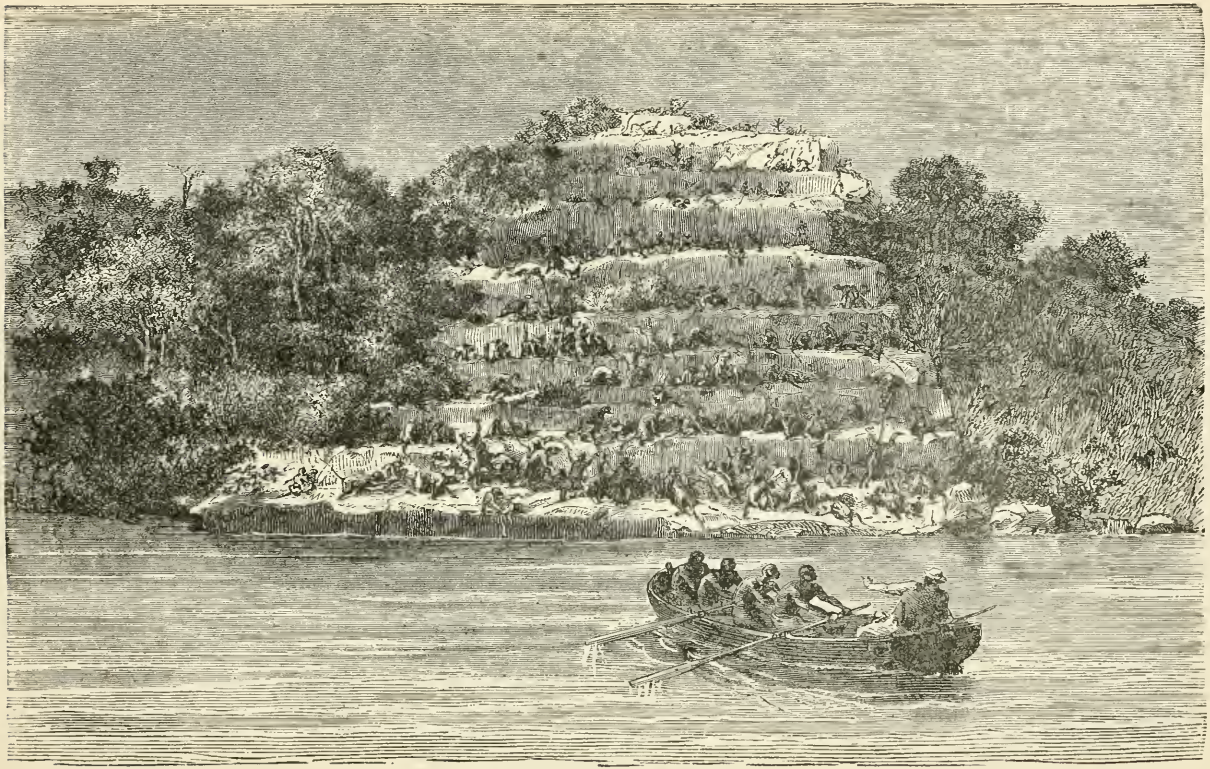
Kigondo said, when he had been seated, "I saw this man carrying a bundle, and running hard, by which I knew that he was deserting you. We (my wife and I) were sitting in our little watch-hut, watching our corn; and, as the road runs close by, this man was obliged to come close to us. We called to him when he was near, saying, 'Master, where are you going so fast? Are you deserting the Musungu, for we know you belong to him, since you bought from us yesterday two doti worth of meat?' 'Yes,' said he, 'I am running away; I want to get to Simbamwenni. If you will take me there, I will give you a doti.' We said to him then, 'Come into our house, and we will talk it over quietly.' When he was in our house in an inner room, we locked him up, and went out again to the watch; but leaving word with the women to look out for him. We knew that if you wanted him you would send askari (soldiers) after him. We had but lit our pipes when we saw two men armed with short guns, and having no loads, coming along the road, looking now and then on the ground, as if they were looking at footmarks. We knew them to be the men we were expecting; so we hailed them, and said, 'Masters, what are ye looking for?' They said, 'We are looking for a man who has deserted our master. Here are his footsteps. If you have been long in your hut you must have seen him. Can you tell us where he is?' We said, 'Yes, he is in our house. If you will come with us, we will give him up to you; but your master must give us something for catching him.'"

As Kigondo had promised to deliver Kingaru up, there remained nothing further to do for Uledi and Sarmean but to take charge of their prisoner, and bring him and his captors to my camp on the western bank of the Makata. Kingaru received two dozen lashes, and was chained: his captor four yards of cloth, besides five strings of red coral beads for his wife, causing the man to go away very happy.

MONKEYS AND INSECTS.

Approaching the land of Ugogo, the expedition found all kinds of animal life in a flourishing condition. Rhinoceroses, steinboks and antelopes were numerous. Some hills were literally covered with monkeys.

Second to the earwigs in importance and in numbers were the white ants, whose powers of destructiveness were simply awful. Mats, cloth, portmanteaus, clothes, in short, every article seemed on the verge of destruction, and, as the explorers witnessed their voracity, they felt anxious lest tents should be devoured while they slept. This was the first



A MOUNTAIN OF MONKEYS.

camp since leaving the coast where their presence became a matter of anxiety; at all other camping places hitherto the red and black ants had usurped their attention, but at Mpwapwa the red species were not seen, while the black were also very scarce.

A MOB AT UGOGO.

Having arrived at Ugogo, the first objective point of the expedition, the travelers found themselves the objects of the most annoying curiosity. A white man was a strange being. Says our hero: The first words I heard in Ugogo were from a Wagogo elder, of sturdy form, who in an indolent way tended the flocks, but showed a marked interest in the stranger clad in white flannels, with a Hawkes' patent cork solar topee on his head, a most unusual thing in Ugogo, who came walking past him, and there were "Yambo, Musungu, Yambo, bana, bana," delivered with a voice loud enough to make itself heard a full mile away. No sooner had the greeting been delivered than the word "Musungu" seemed to electrify his entire village; and the people of other villages, situated at intervals near the road, noting the excitement that reigned at the first, also participated in the general frenzy which seemed suddenly to have possessed them. I consider my progress from the first village to Mvumi to have been most triumphant; for I was accompanied by a furious mob of men, women and children, all almost as naked as Mother Eve when the world first dawned upon her in the garden of Eden, fighting, quarreling, jostling, staggering against each other for the best view of the white man, the like of whom was now seen for the first time in this part of Ugogo. The cries of admiration, such as "Hi-le!" which broke often and in confused uproar upon my ear, were not gratefully accepted, inasmuch as I deemed many of them impertinent. A respectful silence and more reserved behavior would have won my esteem; but, ye powers, who cause etiquette to be observed in Africa, respectful silence, reserved behavior, and esteem are terms unknown in savage Ugogo. Hitherto I had compared myself to a merchant of Bagdad traveling among the Kurds of Kurdistan, selling his wares of Damascus silk; but now I was compelled to lower my standard, and thought myself not much better than a monkey in a zoological collection. One of my soldiers requested them to lessen their vociferous noise; but the evil-minded race ordered him to shut up, as a thing unworthy to speak to the Wagogo! When I imploringly turned to the Arabs for counsel in this strait, an old Sheikh said, "Heed them not; they are dogs who bite besides barking."

Hitherto, those we had met had contented themselves with staring and shouting; but these outstepped all bounds, and my growing anger at their excessive insolence vented itself in gripping the rowdiest of them by the neck, and before he could recover from his astonishment administering a sound thrashing with my dog-whip, which he little relished. This proceeding educed from the tribe of starers all their native power of vituperation and abuse, in expressing which they were peculiar. Approaching in manner to angry tom-cats, they jerked out their words with something of a splitting hiss and a half bark. The ejaculation, as near as I can spell it phonetically, was "hahcht," uttered in a shrill crescendo tone. They paced backwards and forwards, asking themselves, "Are the Wagogo to be beaten like slaves by this Musungu?" But whenever I made motion, flourishing my whip towards them, these mighty braggarts found it convenient to move to respectable distances from the irritated Musungu.

Perceiving that a little manliness and show of power was something which the natives long needed, and that in this instance it relieved me from annoyance, I had recourse to my whip, whose long lash cracked like a pistol shot whenever they overstepped moderation. So long as they continued to confine their obtrusiveness to staring, and communicating to each other their opinions respecting my complexion, and dress, and accoutrements, I philosophically resigned myself in silence for their amusement; but when they pressed on me, barely allowing me to proceed, a few vigorous and rapid slashes right and left with my serviceable thong, soon cleared the track.

A RENOWNED MOGUL.

Arrived at Mizanza, the lofty tent, and the American flag which ever flew from the centre pole, attracted the Sultan of that place towards it, and was the cause of a visit with which he honored Stanley. As he was notorious among the Arabs for having assisted Manwa Sera in his war against Sheikh Sny bin Amer, high eulogies upon whom have been written by Burton, and subsequently by Speke, and as he was the second most powerful chief in Ugogo, of course he was quite a curiosity. As the tent-door was uplifted that he might enter, the ancient gentleman was so struck with astonishment at the lofty apex and internal arrangements, that the greasy Barsati cloth which formed his sole and only protection against the chills of night and the heat of noon, in a fit of abstraction was permitted to fall down to his feet, exposing to the Musungu's unhallowed gaze the sad and aged wreck of what must once have been a towering form. His son, a youth of about fifteen, attentive to the infirmities of his father, hastened with filial duty to remind him of his condition, upon which, with an idiotic titter at the incident, he resumed his scanty apparel and sat down to wonder and gibber out his admiration at the tent and the strange things which formed the Musungu's personal baggage and furniture. After gazing in stupid wonder at the table, on which was placed some crockery and a few books; at the slung hammock, which he believed was suspended by some magical contrivance; at the portmanteaus which contained a stock of clothes, he ejaculated, "Hi-le! the Musungu is a great sultan, who has come from his country to see Ugogo." He then noticed Stanley, and was again wonder-struck at his pale complexion and straight hair, and the question now propounded was, "How on earth was Stanley white when the sun had burned his people's skins into blackness?" Whereupon he was shown the traveler's cork topee, which he tried on his woolly head, much to his amusement. The guns were next shown to him; the wonderful repeating rifle of the Winchester Company, which was fired thirteen times in rapid succession to demonstrate its remarkable murderous powers. If he was astonished before, he was a thousand times more so now, and expressed his belief that the Wagogo could not stand before the Musungu in battle, for wherever a Wagogo was seen such a gun would surely kill him. Then the other firearms were brought forth, each with its peculiar mechanism explained, until, in a burst of enthusiasm at such riches and power, he said he would send Stanley a sheep or goat, and that he would be his brother. Stanley thanked him for the honor, and promised to accept whatever he was pleased to send. At the instigation of Sheikh Thani, who acted as interpreter, who said that Wagogo chiefs must not depart with empty hands, Stanley cut off two yards of cloth and presented it to him, which, after being examined and measured, was refused upon the ground that, the Musungu being a great sultan should not demean himself so much as to give him only two yards. As he was about to present a sheep or goat another piece would not matter much.

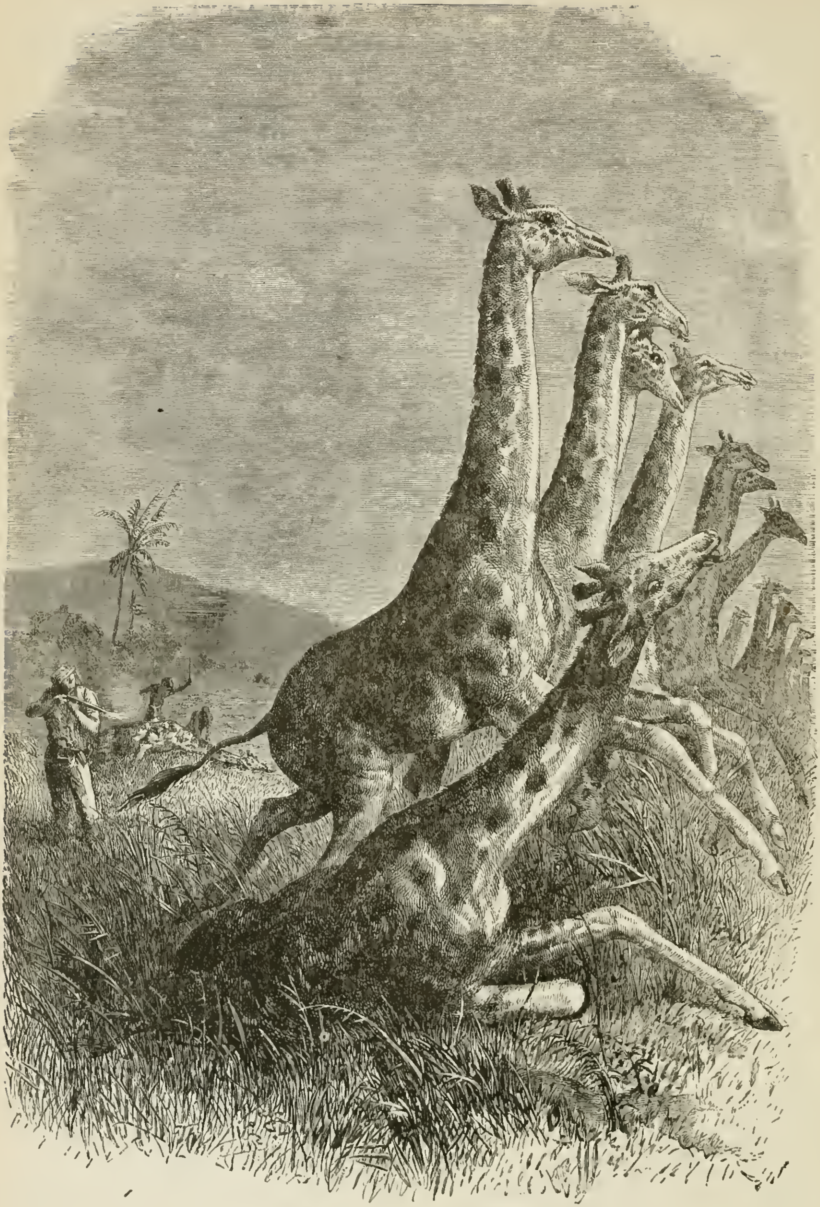
Shortly after he departed, and true to his promise, he sent a large, fine sheep, with a broad tail, heavy with fat; but with the words, "That being now his brother, Stanley must send him twelve of good cloth." As the price of a sheep is but six yards, Stanley refused the sheep and the fraternal honor, upon the ground that the gifts were all on one side, and he could not afford to part with any more cloth without an adequate return.

The caravan next halted for a short time at Little Mukondoku. Twelve yards of cloth as duty satisfied the Sultan, whose district contains but two villages, mostly occupied by pastoral Wahumba. The Wahumba live in plastered cone huts, shaped like the tartar tents of Turkestan. The Wahumba are a fine and well-formed race. The men are positively handsome, tall, with small heads, the posterior parts of which project considerably. One will look in vain for a thick lip or a flat nose amongst them; on the contrary, the mouth is exceedingly well cut, delicately small; the nose is that of the Greeks, and so universal was the peculiar feature, that Stanley at once named them the Greeks of Africa. Their lower limbs have not the heaviness of the Wagogo and other tribes, but are long and shapely, clean as those of an antelope. Their necks are long and slender, on which their small heads are poised most gracefully. Athletes from their youth, shepherd bred, and intermarrying among themselves, thus keeping the race pure, any of them would form a fit subject for the sculptor who would wish to immortalize in marble an Antinous, a Hylas, a Daphnis, or an Apollo. The women are as beautiful as the men are handsome. They have clear ebon skins, not coal-black, but of an inky hue. Their ornaments consist of spiral rings of brass pendent from the ears, brass ring collars about the necks, and a spiral cincture of brass wire about their loins for the purpose of retaining their calf and goat skins, which are folded about their bodies, and, depending from the shoulder, shade one half of the bosom, and fall to the knees.

On the advance, it was noticed that the plains abounded in animals of various descriptions, among them that wonder of the animal creation, the tall and graceful giraffe, which is often game for the hunter.

DESCRIPTION OF AN AFRICAN VILLAGE.

Our traveler was now in Unyanyembe, having pushed his expedition on successfully to this point, and shown a genius for overcoming all difficulties. Of one of the villages and its surroundings he speaks in this wise: We crossed a ridge, and soon saw Kwihara lying between two low ranges of hills, the northernmost of which was terminated westward by the round fortress-like hill of Zimbili. There was a cold glare of intense sunshine over the valley, probably the effect of a universal bleakness or an autumnal ripeness of the grass, unrelieved by any depth of color to vary the universal sameness. The hills were bleached, or seemed to be, under that dazzling sunshine, and clearest atmosphere. The corn had long been cut, and there lay the stubble, and fields—a browny-white expanse; the houses were of mud, and their flat roofs were of mud, and the mud was of a browny-whiteness; the huts were thatched, and the stockades around them of barked timber, and these were of a browny-whiteness. The cold, fierce, sickly wind from the mountains of Usagara sent a deadly chill to our very marrows, yet the intense sunshiny glare never changed; a black cow or two, or a tall tree here and there, caught the eye for a moment, but they never made one forget that the first impression of Kwihara was as of a picture without color, or of food without taste; and if one looked up, there was a sky of a pale blue, spotless, and of an awful serenity and cheerless color. The second day of the arrival of the expedition in Unyanyembe, the



HUNTING THE GIRAFFE.

country which is looked upon as classic ground, since Capts. Burton, Speke and Grant years ago visited it, and described it, came the Arab magnates from Tabora to congratulate the traveler. Tabora is the principal Arab settlement in Central Africa. It contains over a thousand huts and tembes, and one may safely estimate the population, Arabs and natives, at five thousand people.

They were a fine, handsome body of men, these Arabs. They mostly hailed from Oman, and each of the visitors had quite a retinue with him. At Tabora they live quite luxuriously. The plain on which the settlement is situated is exceedingly fertile, though naked of trees; the rich pasturage it furnishes permits them to keep large herds of cattle and goats, from which they have an ample supply of milk, cream, butter, and ghee. Rice is grown everywhere; sweet potatoes, yams, muhogo, holcus sorghum, maize, or Indian corn, sesame, millet, field-peas, or vetches, called choroko, are cheap, and always procurable. Around their tembes the Arabs cultivate a little wheat for their own purposes, and have planted orange, lemon, papaw, and mangoes, which thrive here fairly well. Onions and garlic, chilies, cucumbers, tomatoes, and brinjalls, may be procured by the white visitor from the more important Arabs, who are undoubted epicureans in their way. Their slaves convey to them from the coast, once a year at least, their stores of tea, coffee, sugar, spices, jellies, curries, wine, brandy, biscuits, sardines, salmon, and such fine cloths and articles as they require for their own personal use. Almost every Arab of any eminence is able to show a wealth of Persian carpets, and most luxurious bedding, complete tea and coffee-services, and magnificently carved dishes of tinned copper and brass lavers. Several of them sport gold watches and chains, mostly all a watch and chain of some kind. And, as in Persia, Afghanistan, and Turkey, the harems form an essential feature of every Arab's household; the sensualism of the Mohammedans is as prominent here as in the Orient.

STANLEY AT A COUNCIL OF WAR.

The visit of these magnates, under whose loving protection white travelers must needs submit themselves, was only a formal one, such as an Arab etiquette, ever of the stateliest and truest, impelled them to make. After having expended their stock of congratulations and nonsense, they departed, having stated their wish that Stanley should visit them at Tabora and partake of a feast which they were about to prepare for him. Three days afterwards he sallied out with eighteen bravely dressed men of his escort to pay Tabora a visit. On surmounting the saddle over which the road from the valley of Kwihara leads to Tabora, the plain on which the Arab settlement is situated lay before them, one expanse of dun pasture land, stretching from the base of the hill on the left as far as the banks of the northern Gombe, which a few miles beyond Tabora heave into purple-colored hills and blue cones.

Within three-quarters of an hour they were seated on the mud veranda of the tembe of Sultan bin Ali, who, because of his age, his wealth, and position, is looked upon by his countrymen, high and low, as referee and counselor. His boma or enclosure contains quite a village of hive-shaped huts. From here, after being presented with a cup of Mocha coffee, and some sherbet, the visitors directed their steps towards Khamis bin Abdullah's house, who had, in anticipation of their coming, prepared a feast to which he had invited his friends and neighbors. The group of stately Arabs in their long white dresses, and jaunty caps, also of a snowy white, who stood ready to welcome Stanley to Tabora, produced quite an effect on his mind. He was in time for a council of war they were holding—and he was requested to attend.

Khamis bin Abdullah, a bold and brave man, ever ready to stand up for the privileges of the Arabs, and their rights to pass through any countries for legitimate trade, is the man who, in Speke's "Journal of the Discovery of the Source of the Nile," is reported to have shot Maula, an old chief who sided with Manwa Sera during the wars of 1860; and who subsequently, after chasing his relentless enemy for five years through Ugogo and Unyamwezi, had the satisfaction of beheading him, and was now urging the Arabs to assert their rights against a chief called Mirambo of Uyoweh, in a crisis which was advancing.

EXPLOITS OF AN AFRICAN WARRIOR..

The Mirambo of Uyoweh, it seems, had for the last few years been in a state of chronic discontent with the policies of the neighboring chiefs. Formerly a porter for an Arab, he had now assumed regal power, with the usual knack of unconscionable rascals who care not by what means they step into power. When the chief of Uyoweh died, Mirambo, who was head of a gang of robbers infesting the forests of Wilyankuru, suddenly entered Uyoweh, and constituted himself lord paramount by force. Some feats of enterprise, which he performed to the enrichment of all those who recognized his authority, established him firmly in his position. This was but a beginning; he carried war through several countries, and after destroying the populations over three degrees of latitude, he conceived a grievance against Mkasiwa, and against the Arabs, because they would not sustain him in his ambitious projects against their ally and friend, with whom they were living in peace.

The first outrage which this audacious man committed against the Arabs was the halting of an Ujiji-bound caravan, and the demand for five kegs of gunpowder, five guns, and five bales of cloth. This extraordinary demand, after expending more than a day in fierce controversy, was paid; but the Arabs, if they were surprised at the exorbitant blackmail demanded of them, were more than ever surprised when they were told to return the way they came; and that no Arab caravan should pass through his country to Ujiji except over his dead body. On the return of the unfortunate Arabs to Unyanyembe, they reported the facts to Sheikh Sayd bin Salim, the governor of the Arab colony. This old man, being averse to war, of course tried every means to induce Mirambo as of old to be satisfied with presents; but Mirambo this time was obdurate, and sternly determined on war unless the Arabs aided him in the warfare he was about to wage against old Mkasiwa, sultan of one of the tribes of Unyanyembe.

"This is the status of affairs," said Khamis bin Abdullah. "Mirambo says: that for years he has been engaged in war against the neighboring Washensi and has come out of it victorious; he says this is a great year with him; that he is going to fight the Arabs and others, and that he shall not stop until every Arab is driven from Unyanyembe, and he rules over this country. Children of Oman, shall it be so? Speak, Salim, son of Sayf, shall we go to meet this Mshensi (pagan) or shall we return to our island?"

A DECLARATION OF WAR.

A murmur of approbation followed the speech of Khamis bin Abdullah, the majority of those present being young men eager to punish the audacious Mirambo. Salim, the son of Sayf, an old patriarch, slow of speech, tried to appease the passions of the young men, scions of the aristocracy, but Khamis's bold words had made too deep an impression on their minds. Soud, the handsome Arab, the son of Sayd the son of Majid, spoke: "My father used to tell me that he remembered the days when the Arabs could go through the country from Bagamoyo to Ujiji, armed with canes. Those days are gone by. We have stood the insolence of the Wagogo long enough. Swaruru of Usui just takes from us whatever he wants; and now, here is Mirambo, who says, after taking more than five bales of cloth as tribute from one man, that no Arab caravan shall go to Ujiji, but over his body. Are we prepared to give up the ivory of Ujiji and other places because of this one man? I say war—war until we have got his beard under our feet—war until we can again travel through any part of the country with only our walking canes in our hands!"

The universal assent that followed Soud's speech proved beyond a doubt that there would be war. Stanley thought of Livingstone. What if he were marching to Unyanyembe directly into the war country?

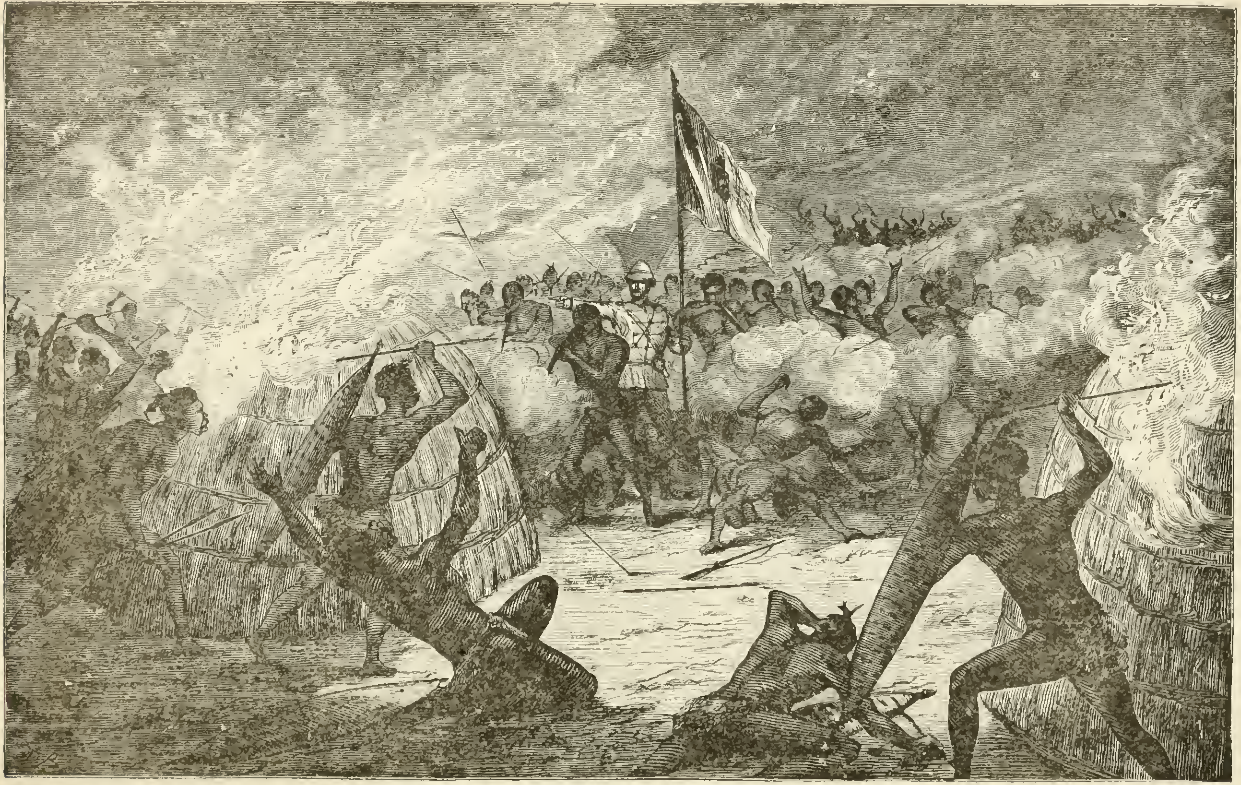
Having found from the Arabs that they intended to finish the war quickly, our explorer volunteered to accompany them. His hope was, that it might be possible, after the defeat of Mirambo, and his forest banditti, to take his expedition direct to Ujiji by the road now closed. The Arabs were sanguine of victory, and he partook of their enthusiasm.

The council of war broke up. A great dishful of rice and curry, in which almonds, citron, raisins, and currants were plentifully mixed, was brought in, and it was wonderful how soon the warlike fervor was forgotten after attention had been drawn to this royal dish. Stanley, of course, not being a Mohammedan, had a dish of his own, of a similar composition, strengthened by platters containing roast chicken, and kabobs, crullers, cakes, sweetbread, fruit, glasses of sherbet and lemonade, dishes of gum-drops and Muscat sweetmeats, dry raisins, prunes, and nuts. Certainly Khamis bin Abdullah proved that if he had a warlike soul in him, he could also attend to the cultivated tastes acquired under the shade of the mangoes on his father's estate in Zanzibar—the island which is furnished with the comforts of civilized life.

OFF TO THE WAR.

Mr. Stanley gives us this graphic account of the military operations: There was a total of two thousand, two hundred and fifty-five men. Of these men one thousand five hundred were armed with guns—flint-lock muskets, German and French double-barrels, some English Enfields, and American Springfields—besides these muskets, they were mostly armed with spears and long knives for the purpose of decapitating, and inflicting vengeful gashes in the dead bodies. Powder and ball were plentiful: some men were served a hundred rounds each, my people received each man sixty rounds. Strict orders had been given by the several chiefs to their respective commands not to fire, until they were within shooting distance of the enemy. Khamis bin Abdullah crept through the forest to the west of the village. The Wanyamwezi took their position before the main gateway, aided by the forces of Soud the son of Sayd on the right, and the son of Habib on the left. Abdullah, Mussoud, myself, and others made ready to attack the eastern gates, which arrangement effectually shut them in, with the exception of the northern side.

Suddenly, a volley opened on us, as we emerged from the forest along the Unyanyembe road, in the direction they had been anticipating the sight of an enemy, and immediately the attacking forces began their firing in most splendid style. There were some ludicrous scenes of men pretending to fire, then jumping off to one side, then forward, then backward, with the agility of hopping frogs, but the battle was none the



FURIOUS ATTACK ON THE VILLAGE.

less in earnest. The breech-loaders of my men swallowed my metallic cartridges much faster than I liked to see; but happily there was a lull in the firing, and we were rushing into the village from the west, the south, the north, through the gates and over the tall palings that surrounded the village, like so many Merry Andrews; and the poor villagers were flying from the enclosure towards the mountains, through the northern gate, pursued by the fleetest runners of our force, and pelted in the back by bullets from breech-loaders and shot-guns. The village was strongly defended, and not more than twenty dead bodies were found in it, the strong thick wooden paling having afforded excellent protection against our bullets.

From Zimbizo, after having left a sufficient force within, we sallied out, and in an hour had cleared the neighborhood of the enemy, which we committed to the flames, after gutting them of all valuables. A few tusks of ivory, and about fifty slaves, besides an abundance of grain, composed the "loot," which fell to the lot of the Arabs.

A FRIGHTFUL MASSACRE.

Early one evening, soon after this, the entire camp of Zimbizo was electrified with the news that all the Arabs (about five hundred) who had accompanied Soud bin Sayd against Mirambo's village had been killed, and that more than one-half of his party had been slain. Some of my own men were also killed. I learned that they had succeeded in capturing Wilyankuru in a very short time, that Mirambo and his son were there, that as they succeeded in effecting an entrance, Mirambo had collected his men, and after leaving the village, had formed an ambush in the grass, on each side of the road, between Wilyankuru and Zimbizo, and that as the attacking party were returning home, laden with over a hundred tusks of ivory, and sixty bales of cloth, and two or three hundred slaves, Mirambo's men suddenly rose up on each side of them, and stabbed them with their spears. The brave Soud had fired his double-barreled gun and shot two men, and was in the act of loading again when a spear was launched, which penetrated through and through him: all the other Arabs shared the same fate. This sudden attack from an enemy they believed to be conquered so demoralized the party that, dropping their spoil, each man took to his heels, and after making a wide *détour* through the woods, returned to Zimbizo to repeat the dolorous tale.

The effect of this defeat is indescribable. It was impossible to sleep, from the shrieks of the women whose husbands had fallen. All night they howled their lamentations, and sometimes might be heard the groans of the wounded, who had contrived to crawl through the grass unperceived by the enemy. Fugitives were continually coming in throughout the night, but none of my men, who were reported to be dead, were ever heard of again.

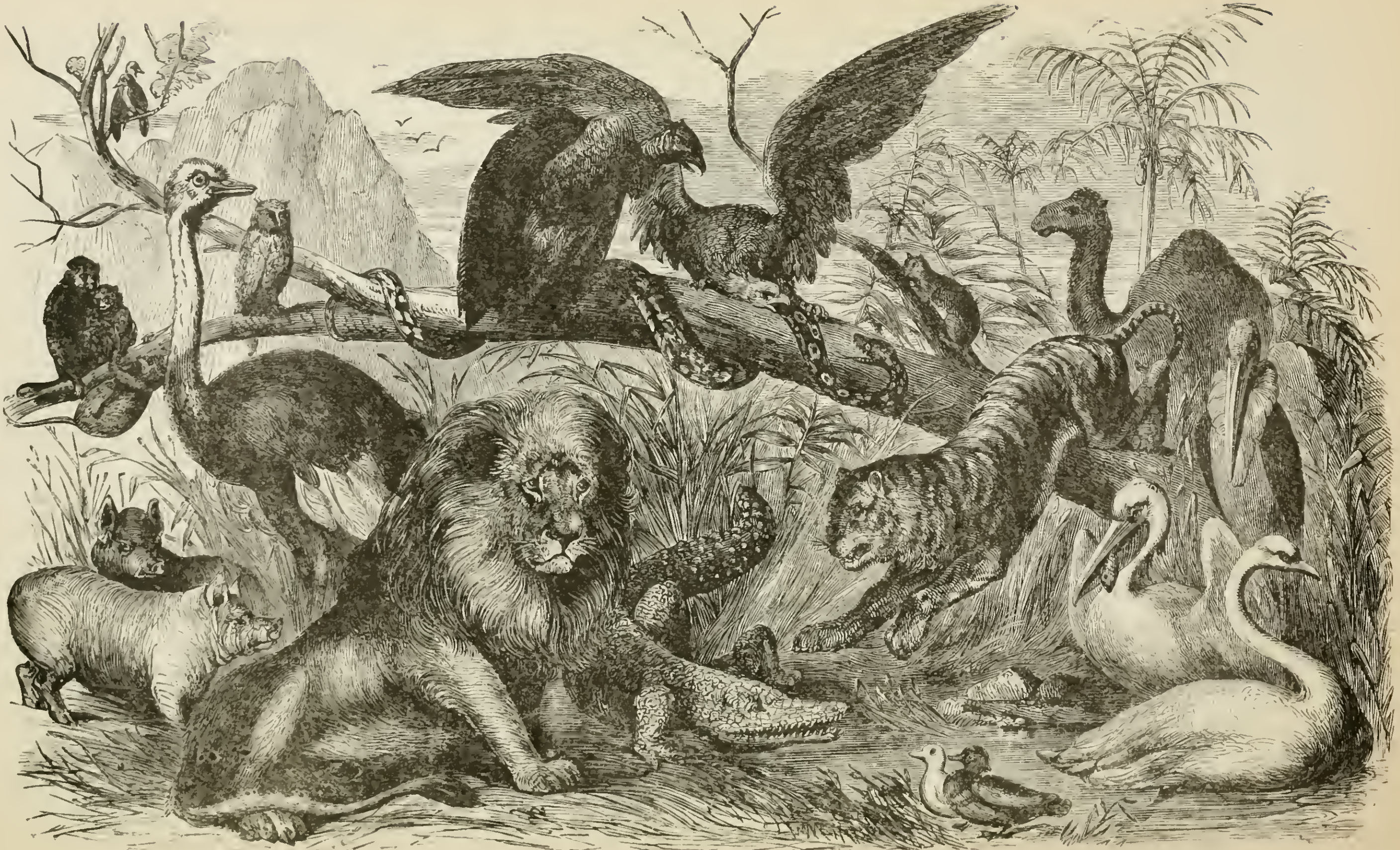
The next day was one of distrust, sorrow, and retreat; the Arabs accused one another for urging war without expending all peaceful means first. There were stormy councils of war held, wherein were some who proposed to return at once to Unyanyembe, and keep within their own houses; and Khamis bin Abdullah raved, like an insulted monarch, against the abject cowardice of his compatriots. I fell asleep, but later on was awakened by Selim saying, "Master, get up, they are all running away, and Khamis bin Abdullah is himself going." This was true. With the aid of Selim I dressed myself, and staggered towards the door, weakened by fever. My first view was of Thani bin Abdullah being dragged away, who, when he caught sight of me, shouted out, "Bana—quick—Mirambo is coming." He was then turning to run, and putting on his jacket, with his eyes almost starting out of their sockets with terror. Khamis bin Abdullah was also about departing, he being the last Arab to leave.

Mirambo was afterward defeated with great loss, and Stanley was able to proceed toward Ujiji by the southern route. On the way he came to the cultivated fields of Manyara. Arriving before the village-gate they were forbidden to enter, as the country was throughout in a state of war, and it behooved the guard to be careful of admitting any party, lest the villagers might be compromised.

A SURLY CHIEF.

After they had built their camp, the guide was furnished with some cloths to purchase food from the village for the transit of a wilderness in front of them, which was said to extend nine marches, or one hundred and thirty-five miles. He was informed that the Mtemi had strictly prohibited his people from selling any grain whatever. This evidently was a case wherein the exercise of a little diplomacy could only be effective; because it would detain them several days here, if they were compelled to send men back to Kikuru for provisions. Opening a bale of choice goods, Stanley selected two royal cloths, and sent them with the compliments and friendship of the white man. The Sultan sulkily refused them, and bade the porter return to the white man and tell him not to bother him. Entreaties were of no avail, he would not relent; and the men, in exceedingly bad temper, and hungry, were obliged to go to bed supperless. There was every prospect of a general decamp of all Stanley's people. However, he told them not to be discouraged; that he would get food for them in the morning.

The bale of choice cloths was opened again next morning, and four royal cloths were this time selected, and the porter was again dispatched,



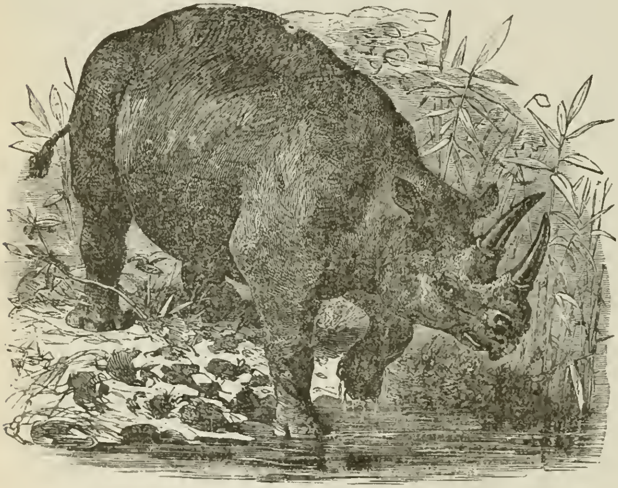
GROUP OF TROPICAL ANIMALS.

burdened with compliments, and polite words. The effect of this munificent liberality was soon seen in the abundance of provender which came to the camp. Before an hour went by, there came boxes full of choroko, beans, rice, matama or dourra, and Indian corn, carried on the heads of a dozen villagers, and shortly after the Mtemi himself came, followed by about thirty musketeers and twenty spearmen, to visit the first white man ever seen on this road. Behind these warriors came a liberal gift, fully equal in value to that sent to him, of several large gourds of honey, fowls, goats, and enough vetches and beans to supply the men with four days' food.

AMUSING EXPERIENCES WITH AN ARAB.

The chief, a tall robust man, and his chieftains, were invited to seat themselves. They cast a look of such gratified surprise at Stanley, his clothes, and guns, as is almost impossible to describe. They looked intently for a few seconds, and then at each other, which ended in an uncontrollable burst of laughter, and repeated snappings of the fingers. The interpreter was requested to inform the chief of the great delight Stanley felt in seeing them. After a short period expended in interchanging compliments, and a competitive excellence at laughing at one another, their chief desired Stanley to show him some of his curiosities. Says Stanley: I next produced a bottle of concentrated ammonia, which, as I explained, was for snake bites and head-aches; the Sultan immediately complained he had a head-ache, and must have a little. Telling him to close his eyes, I suddenly uncorked the bottle, and presented it to His Majesty's nose. The effect was magical, for he fell back as if shot, and such contortions as his features underwent are indescribable. His chiefs roared with laughter, and clapped their hands, pinched each other, snapped their fingers, and committed many other ludicrous things. I verily believe if such a scene were presented on any stage in the world the effect of it would be visible instantaneously on the audience; that had they seen it as I saw it, they would have laughed themselves to hysteria and madness. Finally the Sultan recovered himself, great tears rolling down his cheeks, and his features quivering with laughter, then he slowly uttered the word "kali"—hot, strong, quick, or ardent medicine. He required no more, but the other chiefs pushed forward to get one wee sniff, which they no sooner had, then all went into paroxysms of uncontrollable laughter. The entire morning was passed in this state visit, to the mutual satisfaction of all concerned. "Oh," said the Sultan at parting, "these white men know everything, the Arabs are dirt compared to them!" It had required only a bottle of ammonia to impress him with the vast superiority of his visitor.

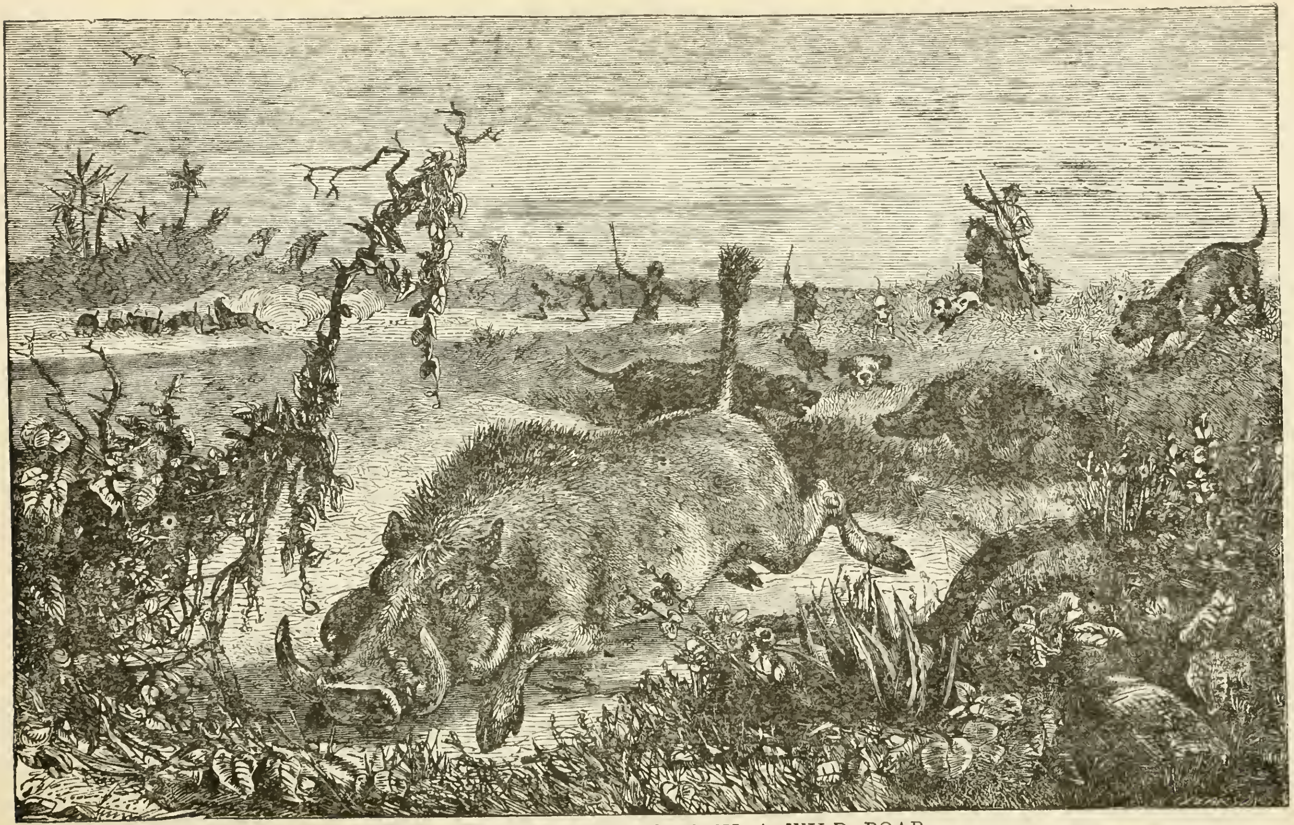
Having made a fresh start after full preparation for the next stage, we had barely left the waving cornfields of my friend Ma-manyara before we came in sight of a herd of noble zebra; two hours afterwards we had entered a grand and noble expanse of park land, whose glorious magnificence and vastness of prospect, with a far-stretching carpet of verdure darkly flecked here and there by miniature clumps of jungle, with spreading trees growing here and there, was certainly one of the finest scenes to be found in Africa. Added to which, as I surmounted one of the numerous small knolls, I saw herds after herds of buffalo and zebra, giraffe and antelope, which sent the blood coursing through my veins in the excitement of the moment, as when I first landed on African soil. We crept along the plain noiselessly to our camp on the banks of the Gombe, the home of the rhinoceros.



THE RHINOCEROS.

Having settled the position of the camp, which overlooked one of the pools found in the depression of the Gombe creek, I took my double-barreled smooth-bore and sauntered off to the park-land. Emerging from behind a clump, three fine plump spring-bok were seen browsing on the young grass just within one hundred yards. I knelt down and fired; one unfortunate antelope bounded upward instinctively, and fell dead. Its companions sprang high into the air, taking leaps about twelve feet in length, as if they were quadrupeds practicing gymnastics, and away they vanished, rising up like India-rubber balls, until a knoll hid them from view. My success was hailed with loud shouts by the soldiers, who came running out from the camp as soon as they heard the reverberation of the gun, and my gun-bearer had his knife at the beast's throat, uttering a fervent "Bismillah!" as he almost severed the head from the body.

We next camped but a few yards from a place which was a favorite resort of wild animals. The herd-keeper who attended the goats and



STANLEY'S ADVENTURE WITH A WILD BOAR.

donkeys, soon after our arrival in camp, drove the animals to water, and in order to obtain it they traveled through a tunnel in the brake, caused by elephants and rhinoceroses. They had barely entered the dark cavernous passage, when a black-spotted leopard sprang, and fastened its fangs in the neck of one of the donkeys, causing it, from the pain, to bray hideously. Its companions set up such a frightful chorus, and so lashed their heels in the air at the feline marauder, that the leopard bounded away through the brake, as if in sheer dismay at the noisy cries which the attack had provoked. The donkey's neck exhibited some frightful wounds, but the animal was not dangerously hurt.

Emerging into the broad sunlight, I strolled further in search of something to shoot. Presently I saw, feeding quietly in the forest which bounded the valley of the Mtambu on the left, a huge, reddish-colored wild boar, armed with most horrid tusks. Leaving Kalulu crouched down behind a tree, and my solar helmet behind another close by—that I might more safely stalk the animal—I advanced towards him some forty yards, and after taking a deliberate aim, fired at his fore shoulder. As if nothing had hurt him whatever, the animal made a furious bound, and then stood with his bristles erected, and tufted tail curved over the back—a most formidable brute in appearance. While he was thus listening, and searching the neighborhood with his keen, small eyes, I planted another shot in his chest, which ploughed its way through his body. Instead of falling, however, as I expected he would, he charged furiously in the direction the bullet had come, and as he rushed past me, another ball was fired, which went right through him; but still he kept on, until within six or seven yards from the trees behind which Kalulu was crouching down on one side, and the helmet was resting behind another, he suddenly halted, and then dropped. But as I was about to advance on him with my knife to cut his throat, he suddenly started up; his eyes had caught sight of the little boy Kalulu, and were then, almost immediately afterwards, attracted by the sight of the snowy helmet. These strange objects on either side of him proved too much for the boar, for, with a terrific grunt, he darted on one side into a thick brake, from which it was impossible to oust him, and as it was now getting late, and the camp was about three miles away, I was reluctantly obliged to return without the meat.

At length, after many perils and adventures, Stanley arrived at Ujiji, having accomplished his mission, yet destined to further extend his fame by discoveries that should awaken the interest of the whole world.

CHAPTER IV.

STANLEY'S ADVENTURES AND DISCOVERIES.

Finding Livingstone—On an African Lake—Illness and Death of Livingstone—Burial—Stanley's Expedition—Cannibals—A Fighting Journey—A Brave Chief—Rescuing a Follower—Cameron's Expedition—A Strange Deity—A King's Burial—Legend of Lake Kassala—Cameron's Adventures.

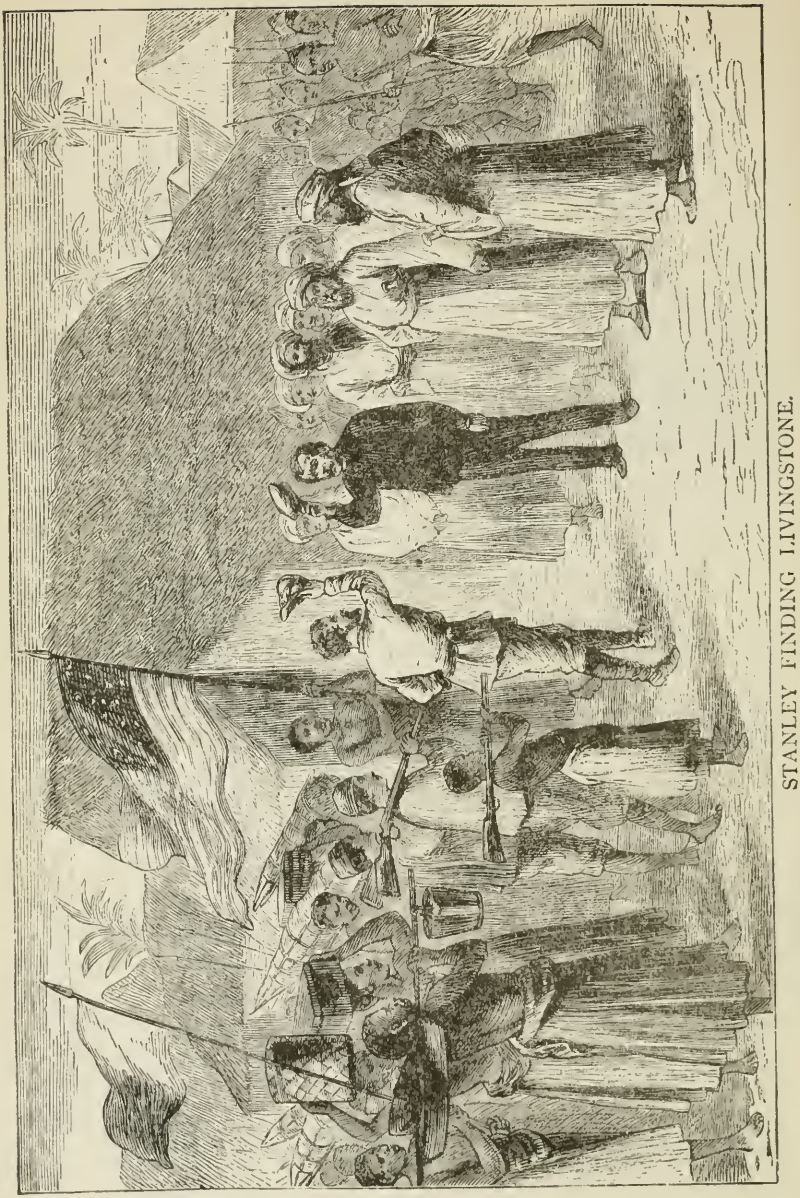
MR. STANLEY has told the story of his search for Livingstone in a manly and straightforward manner: how, as he approached nearer and nearer to the end of his difficult and toilsome journey, his heart was gladdened by reports of Livingstone still being alive; until at last, on the morning of Friday, the 10th of November, 1871, when within a few hundred yards of Ujiji, surrounded by a curious crowd, he suddenly heard a voice say, "Good morning, sir!" and turning, beheld a man arrayed in a long white shirt, with a turban around his woolly head. "Who the mischief are you?" is his inquiry. "I am Susi, the servant of Dr. Livingstone." "What! is Dr. Livingstone here?" "Yes, sir." "In this village?" "Yes, sir." "Are you sure?" "Sure, sure, sir. Why, I leave him just now."

Now another voice is heard, saying, "Good morning, sir!" which proves to be that of Chumah, another of Livingstone's servants.

One can imagine the feelings of the adventurous correspondent as he commands his people to halt, that he may be the first to greet the great traveler. "I pushed back the crowds," he says, "and, passing from the rear, walked down a living avenue of people, until I came in front of the semicircle of Arabs, in the front of which stood the white man with the gray beard. As I advanced slowly toward him I noticed he was pale, looked wearied, wore a bluish cap with a faded gold band round it, had on a red-sleeved waistcoat, and a pair of grey tweed trousers. I would have run to him, only I was a coward in the presence of such a mob—would have embraced him, only, he being an Englishman, I did not know how he would receive me; so I did what cowardice and false pride suggested was the best thing—walked deliberately to him, took off my hat and said,—

"'Dr. Livingstone, I presume?'

"'Yes,' said he, with a kind smile, lifting his cap slightly.



STANLEY FINDING LIVINGSTONE.

"I replaced my hat on my head, and he put on his cap and we grasped hands, and I then said aloud,—

"'I thank God, Doctor, that I have been permitted to see you.'

"He answered, 'I feel thankful that I am here to welcome you.'"

Several days of pleasant intercourse passed between Livingstone and the American. The heart of the great traveler was cheered by the knowledge that he had not been wholly forgotten by the world which he had so long left. His spirits revived, his health and strength became restored, and he looked forward to the prosecution of fresh exploits in the field of geographical discovery. He was asked whether he did not feel a desire to revisit his own country, and take a little rest after his six years of explorations. "I would like very much to go home," he replied, "and see my children once again, but I cannot bring my heart to abandon the task I have undertaken, when it is so nearly completed. Why should I go home before my task is ended, and have to come back again to do what I can very well do now?"

A BOLD PUSH FOR THE INTERIOR.

After a ten days' sojourn at Ujiji, the two travelers set forth to explore the northern half of Lake Tanganyika; and with one canoe pushed out into the lake, following for a time its eastern coast-line. The scenery is described as being both beautiful and varied. Lofty mountains rising abruptly from the water's edge, broad swampy morasses covered with tall reeds and grass, far-stretching plains dotted with villages amid groups of palms and plantains, strips of sandy beach that glistened in sunshine—such were the pictures presented to the travelers' view as they glided day by day over the still water of the lake. The object of the expedition having been accomplished, the head of the canoe was turned southward, and they reached the port of Ujiji in December.

Livingstone accompanied Stanley on his homeward march as far as Unyanyembe, where, after receiving fresh stores and an additional number of followers, he bade him farewell, and turned his steps toward the south of Lake Tanganyika. It was the last white man the heoric traveler was ever destined to see; he was now on his last expedition. Weak and ailing in body, the hardships now to be encountered were to tell fatally upon his constitution. Reaching Lake Bemba, a long detour was made, as it was found impossible to follow the borders because of innumerable creeks and streams hidden by dense vegetation. When the lake was again struck, the opposite shores were gained by means of canoes, which they were obliged to seize from the natives, who were unwilling to lend them. While passing through the country of Ukabende Livingstone's strength gave way, and he was obliged to confess that he could not continue his explorations; he must return to Ujiji to recruit his health. Soon he was compelled to give up walking and take to riding a donkey. Even this mode of traveling became too laborious, and his attendants constructed for him a native bedstead, in which he was carried to his last halting-place. Now followed a long and weary journey, through forests and dreary morasses, beneath the burning sun and in drenching rain. His Nassick boys were very attentive to him, and exhibited a care and devotion beyond praise. "If one of them were ill," they said, "in the course of their journeyings, he always waited for him; but when he himself fell ill or weak, he would push forward and never think of stopping." So now they tried their best to repay their good master's kindness.

DEATH OF THE GREAT EXPLORER.

Arrived at Ilala, the party were refused permission to remain, and were compelled to retrace their steps toward Kabende. Here Livingstone could proceed no farther; he refused all food, and suffered great pain; he frequently prayed, and desired to be alone. So a rude hut was erected, and fenced round to secure privacy and protection. "I shall never cross the high hills to Katanda," he said, "and shall never see my river again." They hovered round the hut, silently awaiting the end, only once a day looking in at the door to say, "Yambo, bana"—"Good morning." So quietly and peacefully did he draw his last breath that they knew not for a time that he was dead. One, drawing near, touched his face, and knew then that the end had come. This was on the night of May 4th, 1873, eight years from the time he last landed on African soil.

His brave followers, being now sure that their great leader was dead, determined to carry the body to Zanzibar. Here it was shipped for England, and in due time landed at Southampton. The ships in the port lowered their flags to half-mast, the shops were closed, and the blinds of private houses drawn, while the bells of the churches tolled, as the body of the great traveler was received on his native shores, to be deposited in Westminster Abbey, with unusual honors. Brave men are never wanting to carry on the great work of African discovery; no sooner does one fall than another is ready to step to the front to prosecute the task. Mr. Stanley resolved at once to complete Livingstone's discoveries.

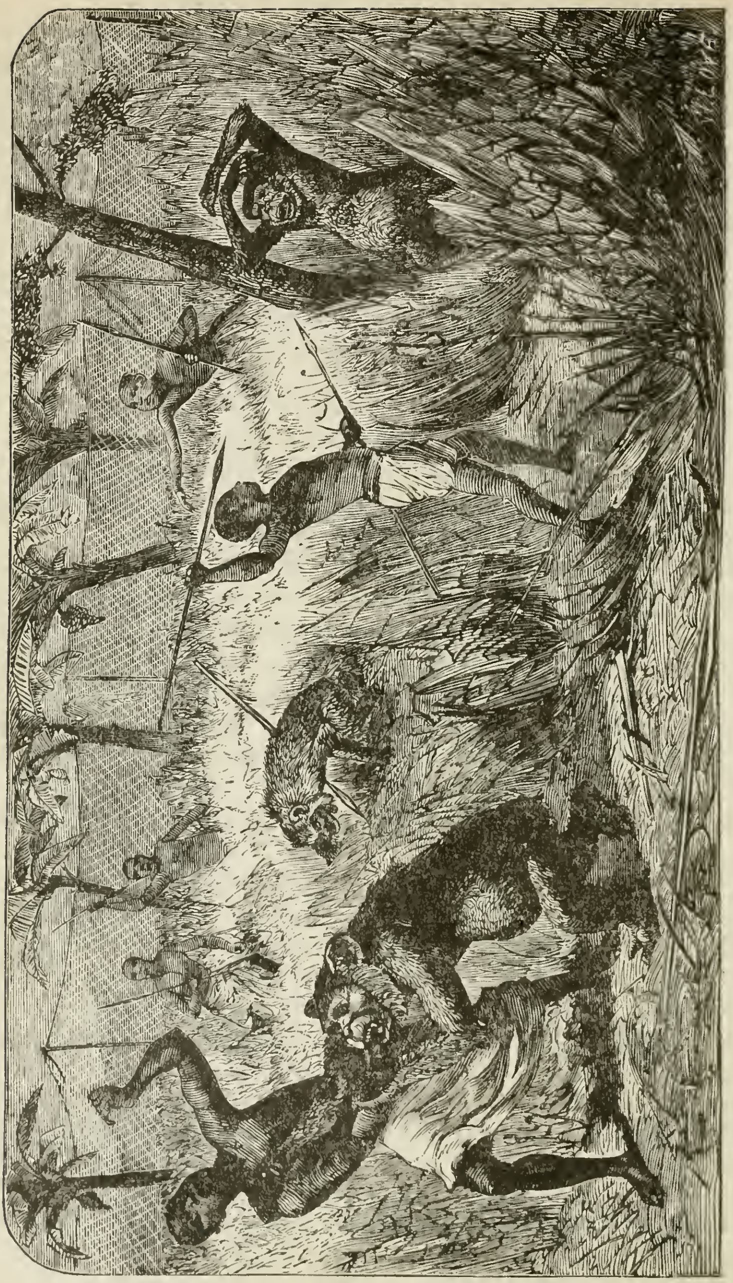
His expedition this time was planned on a large scale, comprising a party of several hundred men to serve as porters, boatmen, and soldiers. In November, 1874, the expedition started from Bagamoyo, on the east coast, presenting a very imposing appearance, from its numbers and length. At the head of the procession, and several hundred yards in advance of the main body, marched four chiefs, then came twelve guides clad in red robes of Jobo, carrying coils of wire; these were followed by a long file of two hundred and seventy men, bearing beads, wire, and cloth, and the sections of an English-made boat, the *Lady Alice*. Then came a number of women and children, belonging to some of the chiefs and boatmen, each bearing loads suitable to their age and strength, and the long procession closing with a rear guard of sixteen chiefs, who took care that no stragglers should linger behind. Stanley's own place in the caravan was wherever his presence was most needed—now at the head, then in the centre, or now at the rear.

The journey thus commenced was likely to be one of considerable toil and danger, and such indeed it proved, even far beyond the calculations of its chief. Many were the hardships endured, many the perils encountered, and many the lives lost before it was triumphantly accomplished. Lakes Victoria and Tanganyika were visited and explored, the great river Lualaba entered and navigated to its mouth—altogether a journey of more than seven thousand miles.

LOST IN THE FOREST.

Let us join our brave traveler at a place called Nyangwé, distant from Lake Tanganyika three hundred and thirty-eight miles, the extreme western locality inhabited by Arab traders from Zanzibar, and situated on the right of the eastern side of the Lualaba, on a high bank about forty feet above the river. On three sides spreads for miles an open country, but on the fourth is an impenetrable forest, through which Mr. Stanley and his followers in vain endeavored to force their way; becoming lost in its recesses, they were compelled to make their way back to Nyangwé. There were, however, discovered in this forest—which they called "The Pagan Forest"—several villages, each consisting of a long straggling street, and in most of these streets were two long rows of skulls imbedded in the ground, with their tops just above the level. The natives said they were the skulls of sokos which had been captured in the forest and eaten; but a close examination proved them to be those of men, women, and children, whose bodies had been served up at feasts. Our travelers had reached a part of Africa inhabited by cannibals. When the men living in these villages lose their wives, they go into mourning by daubing their faces with a thick coat of charcoal paste, which gives them anything but an inviting appearance.

Unable to penetrate the dense forest, our travelers crossed the river Lualaba, and proceeded on their journey along the left bank, through



CANNIBALS KILLING SOKOS,

the Ukusu country. Now indeed commenced the most hazardous and perilous portion of their journey. Several of their number had been lost previous to this, from fever, from the treachery of the natives, and from desertion. Especially had Mr. Stanley grieved at the loss of a brave Englishman, Edward Pocock, who succumbed to the fatal effects of fever; but now many more of their number were destined to leave their bodies on the route, with no memorial placed over their remains to tell the passing stranger who rested beneath.

Almost every mile of their way was opposed by hostile natives; their approach to a village was the signal for the war-drums to sound, and the whole population to turn out armed with bows and arrows, spears, and other warlike weapons, bent upon the entire destruction of the intruders. What made these encounters the more serious was, that the cannibals used poisoned arrows; so that if their victims were not killed outright, death followed soon after a wound was received. Attempts were made to conciliate these terrible barbarians; gifts of beads and cloth were held out for them to receive, but these were rejected; forbearance was equally unavailing—this was looked upon as cowardice. Night and day the travelers were constantly harassed by their active foes. When they pitched their camp on the banks of the river, the enemy would creep silently through the forest and assail them in the rear. More often they would launch their large canoes and boldly attack them from the river itself; and it was often only the deadly precision with which they discharged their rifles that saved them from destruction. After suffering the loss of many men the natives would retire, but usually only to reorganize their flotilla, when the battle would recommence. Thus would the struggle last for hours, until, wearied with fighting, the enemy retired to seek rest, leaving their victors worn out with fatigue.

THE CARAVAN MEETS BLOOD-THIRSTY CANNIBALS.

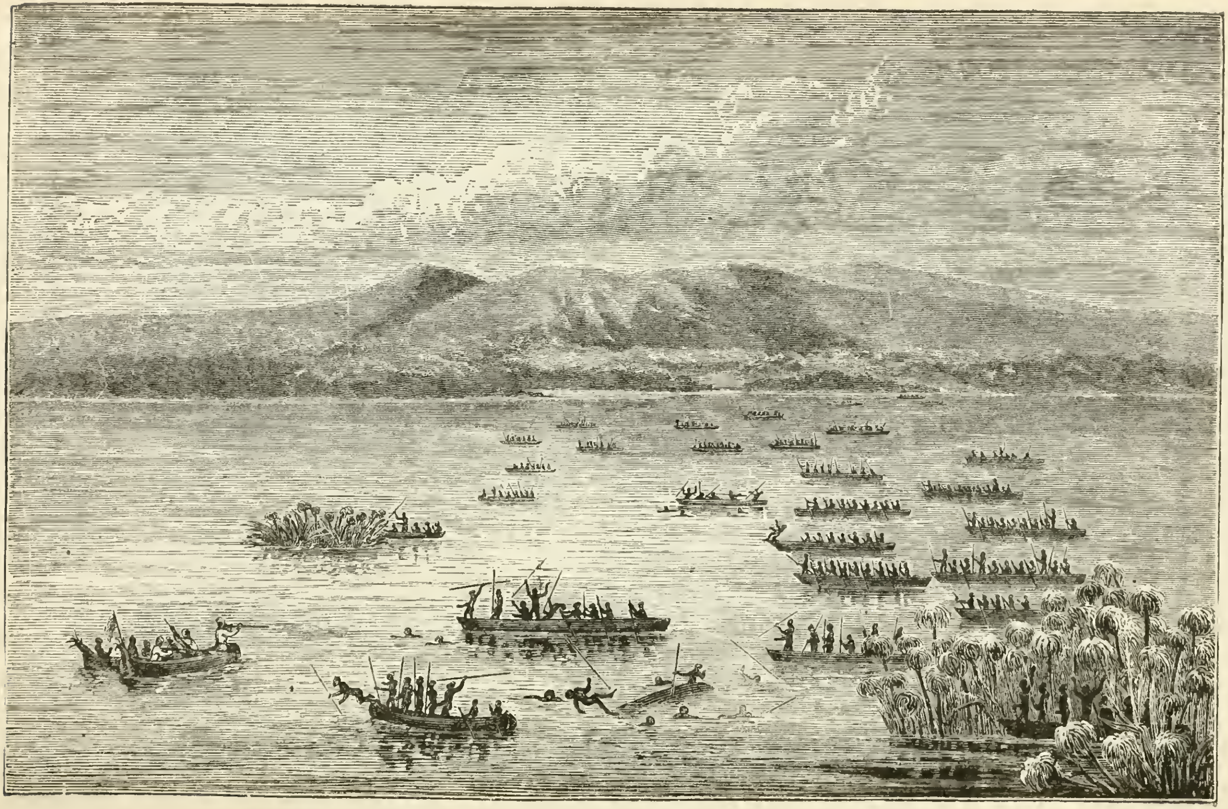
The cannibals fought with great bravery, as Mr. Stanley himself confessed. On one occasion he was particularly struck by the courage and coolness of a young chief. He was in a small canoe, with eight or nine companions, whose shields were placed upright against the sides, and from behind these the arrow was shot and the spear hurled, by none with such dexterity and good aim as by the young chief. Wherever the battle raged the fiercest there darted the canoe to take up an advanced position. At length the brave young African received a wound in the right thigh from a rifle ball. The blood was seen to trickle down his leg; but without retreating, he was observed to lay aside his war weapons, tear a piece of cloth from his dress, stoop down, and coolly bind up the injured limb; then, again seizing his arms, renew the fight as if nothing unusual had taken place, until loss of blood compelled him to give up the contest, and turn his canoe towards the shore. So great was Stanley's admiration for this brave young cannibal that he gave orders for no one to molest him during his retreat.

On another occasion the savages adopted a very novel method in order to make the strangers prisoners. Observing the course they were pursuing, they went some distance on ahead, and during the night fixed an immense net, or a series of nets, among the trees, in which to entangle the travelers, at the same time boasting they were sure to "net their meat." They then hid in ambush, prepared to shoot down their anticipated victims while trying to free themselves from this obstacle to their progress. Fortunately scouts were out watching the movements of the cannibals; so that being duly informed of what was in store, Stanley was able to avoid the trap, much, we may suppose, to the disappointment of his foes.

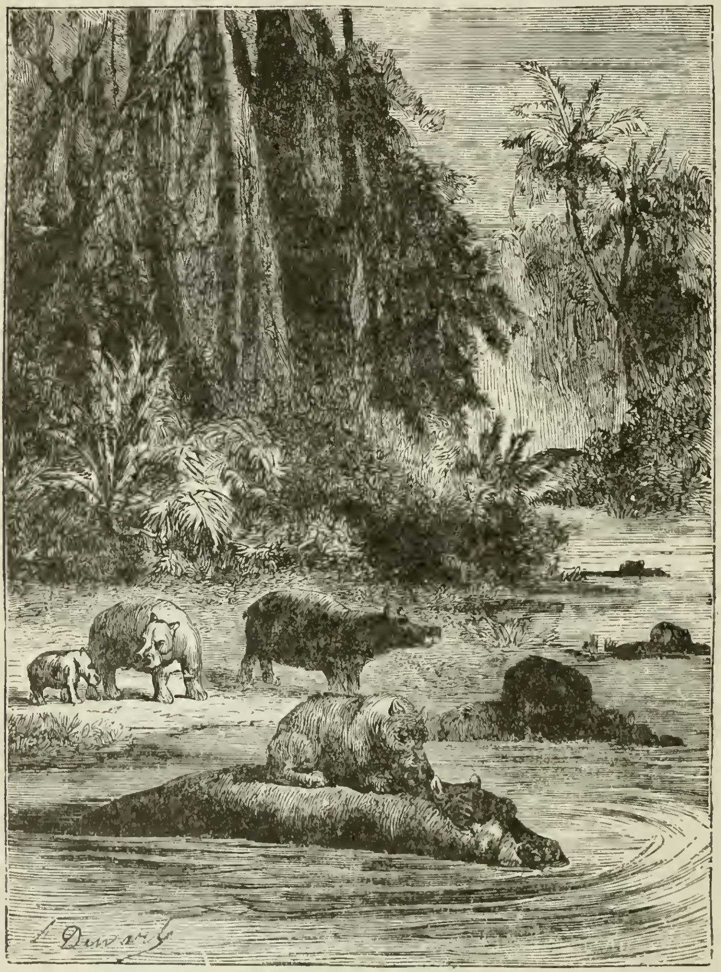
Matters now began to assume a very serious aspect. It was certain the natives were bent upon their destruction, and it was equally certain that the travelers wished to avoid such a fate. But the question was, what were they to do? To proceed seemed impossible, and to abandon the expedition appeared very much like cowardice; yet some of the most disheartened counseled the latter course. They were weary with incessant fighting, and revolted from the idea of being served up as a dinner to their foes; besides, what was the use of traveling in a country of which they knew nothing? But their leader suggested that it would be far better to take to their canoes and make their way down the river. Did any one know in what direction it flowed, and in what country it ended? No, no one knew anything of the river farther than that it led into an unknown country, and among people as hostile as those they had already encountered. Many of the men mutinied and positively refused to go farther. At length, however, Mr. Stanley's wishes were yielded to, and the party set out on their long voyage.

DESPERATE BATTLE ON THE WATER.

Now began a series of aquatic combats, as desperate as the battles fought on land; and it was only the superior weapons of the expedition which enabled the explorers to force their way, as, day after day, they met in conflict. The villages on shore were generally found built close together, so as to make in appearance but one long one, the space dividing one from another being very narrow. When Mr. Stanley and his party approached the end nearest to them of one of these continuous villages, and they were seen by its inhabitants, a perfect chorus of yells would greet them, yells such as could only pro-



STANLEY AND HIS EXPEDITION ATTACKED BY A NATIVE FLEET, ceed from savage throats, and sufficiently appalling to strike terror into even the bravest heart. A tumultuous rush would then be made to the canoes hauled up on the banks, which were quickly launched and thronged with eager and excited cannibals, while others were seen coming with all speed from the farthest end of the village to join in the fight. To place the enemy between two fires, Mr. Stanley would land a number of his men, with orders to seize and hold the last of the villages, which was done by going to the rear of the huts and boldly taking possession—a feat easily accomplished, as the fighting men were with their comrades, and the women and children flying away at



HIPPOPOTAMI AND THEIR YOUNG.

the strangers' approach. The place thus gained was held for the night, although the invaders had to be constantly on the alert, as their vigilant foes left them but scant time for repose.

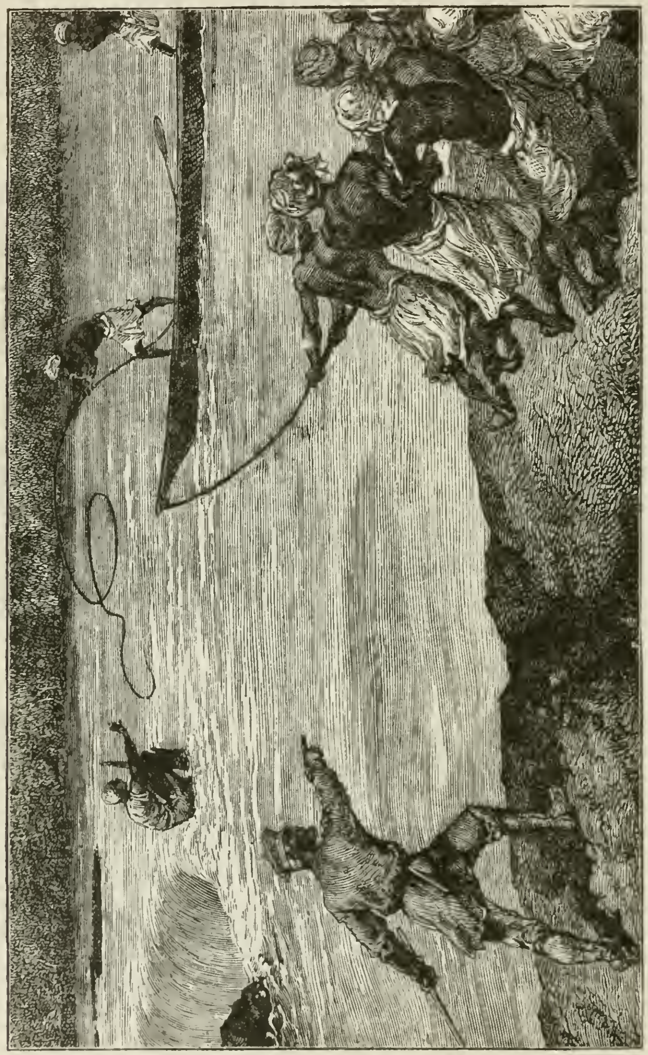
In the midst of all these conflicts their way by water was arrested by a series of great cataracts, as many as five, not far apart from each other, but presenting a serious obstacle to their farther progress. To get beyond these it was found necessary not only to drag their canoes over land, but even to cut a path for them through thirteen miles of dense forest—an arduous labor, as we can well imagine, when it was performed beneath the eyes of an adroit foe, who frequently compelled them to exchange the axe for the rifle. These cataracts Mr. Stanley named after himself, as he had previously christened the river Livingstone. The cataracts passed, a long spell of rest was taken to recruit their exhausted strength. But it was in passing one of these that a serious accident nearly befell several of the party.

THE CHIEF SNATCHED FROM THE JAWS OF DEATH.

To pass one of these rapids it was necessary that a path of three miles should be cut through the forest. Giving directions to his men to paddle the canoes to the landing-place, Mr. Stanley went by himself to blaze the trees, that his men might cut the path in the right direction. Returning from this laborious task, he heard outcries of distress. Hurrying to the river, he was soon acquainted with the reason. In the middle of the stream a canoe containing several men was being swiftly drawn into the rapids; already it was so far sucked into the strength of the current that the paddles were of no further use, and all the men save one leaped into the water to swim to land. The one remaining was a chief, named Zaida, a brave man, but now apparently unnerved by the danger which threatened him, for it was impossible for the frail bark to withstand the seething waters and craggy rocks. Intently the spectators on the banks watched the apparently doomed man, as he approached nearer and nearer to the great point of danger; just when they thought the end had come, the canoe struck upon a rocky point and was instantly shivered to pieces; but at the same moment the chief seized the rocky point, and clung to it with all the strength and tenacity of despair.

It was a perilous position; the angry waters were seen to be constantly dashing over him, so that at times only his head was visible above water. As he faced up stream, to his left were fifty yards of falling water, and to his right as many yards of leaping brown waves. Behind, the water fell six to eight feet, through a gap ten yards wide, between the rocky point to which he clung, and a rocky islet about thirty yards long.

The leader, after a few moments' reflection, decided upon a course of action and resolved to do his utmost to rescue the imperilled man. He sent some of his men into the forest to collect a number of rattans; these were joined together, one long one fastened to the stern of the canoe, and one to the side and prow, while a third and shorter one was secured to the head, to be thrown to the chief. Two volunteers were called for to steer the vessel as near the rocky point as possible. For an instant all drew back; none seemed inclined



RESCUE OF ZAIDA.

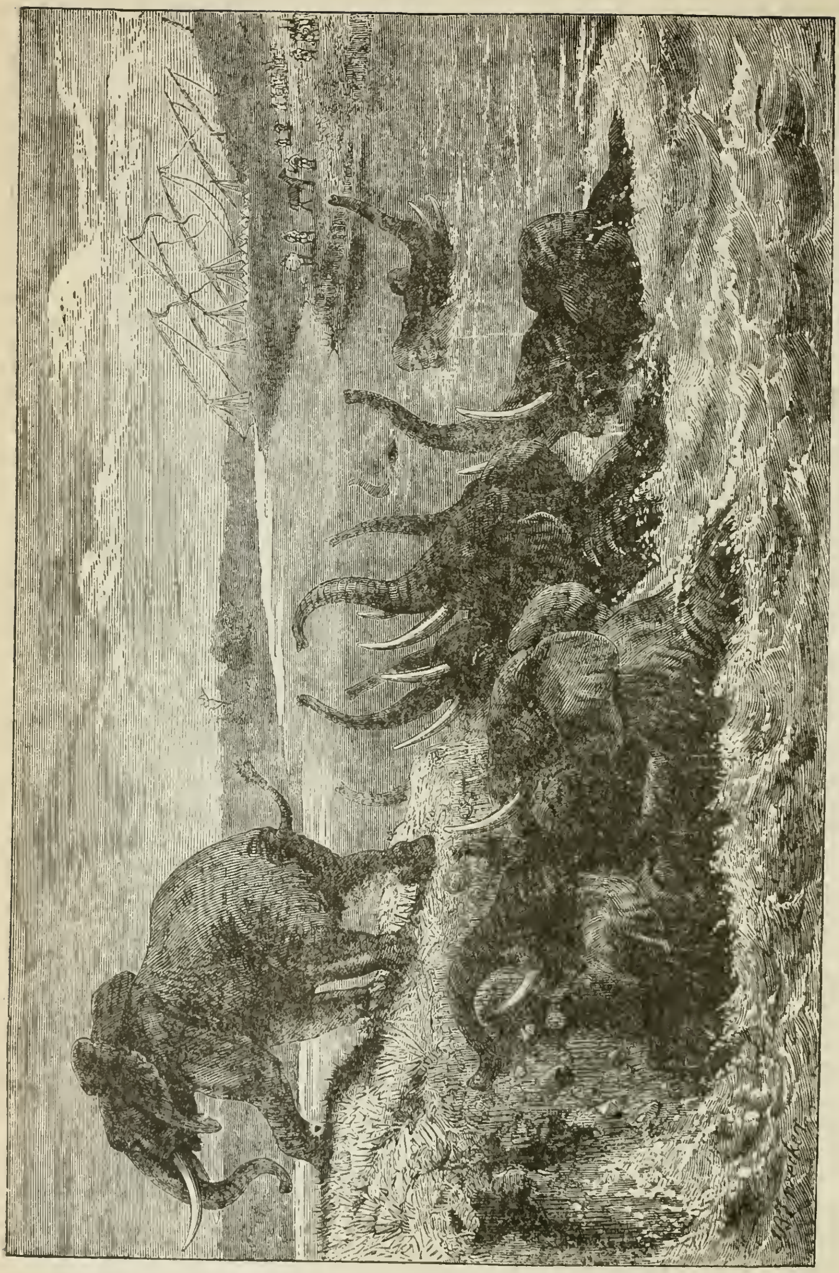
to venture upon so hazardous an exploit. At length Uledi, coxswain of the *Lady Alice*, stepped forward; then, fired by his example, several of the boat-boys expressed their willingness to embark. One was chosen, and the canoe was pushed out into the stream, the men on the banks holding on to rattans to prevent it being swept over the falls. Coolly and steadily the two men approached the scene of danger, when a cry was raised that one of the rattans had broken. In another moment a second parted, and, just as Zaida succeeded in catching the one thrown to him, and securing it round his body, the third gave way, and the canoe was whirled to destruction. But the instant it neared the rocky islet, Uledi and his companion sprang upon it, and soon succeeded in drawing the unfortunate chief to them. Thus all three were in comparatively safe quarters, but somewhat exposed, and the problem still remained to be solved: how soon were they to be rescued?

It was too late to make any further attempts that day, for darkness had come on; so they were told to keep up their courage till the morning, when all would be well. As soon as there was sufficient light on the following day, the three castaways were seen safe on the islet. More rattans were gathered from the forest, and made doubly strong; secured as before, a canoe was pushed into the current, and allowed to drift near to the islet. Uledi and the boat-boy plunged into the water and succeeded in reaching it. Clambering in, they were not long in towing the chief to the same ark of refuge; but now, knowing he could not be very well swept away, he preferred swimming to the shore, and in due time all three were standing safely on dry land. A great shout of joy and triumph was raised, which even the distant cannibals heard.

Mr. Stanley speaks in high terms of Uledi. He says: "He is a young fellow, twenty-seven or twenty-eight years old, lithe and active as a leopard and brave as a lion. He is one of a hundred thousand. I doubt whether there is another in the island of Zanzibar equal to him. There are few in this expedition who have not been indebted to him for life, timely rescue, or brave service. He was the first in war, and the most modest in peace. He was the best soldier, the best swimmer, the best carrier, the best sailor, the best workman in wood or iron, and the most faithful of the black faithfuls."

STANLEY AND HIS MEN IN PERIL.

The cataracts passed, the river's course altered to the northwest, then west, then southwest, in places from two to ten miles broad, but full of islands, among which the explorers were obliged to paddle, to avoid the bloodthirsty cannibals; often, too, passing days without food



ELEPHANTS IN A DIFFICULTY.

until hunger compelled them to land. The scenery on the route was often magnificent; the banks of the river fringed with enormous trees joined together by a network of creeping plants. Now and then a cascade would meet the sight. Turn which way they would, something beautiful or grand arrested the eye. It was the cannibals alone who kept them from enjoying its delights; for when followed, surrounded, or attacked by savages thirsting for their lives, we may well believe that they could not tranquilly enjoy the beauty which reigned around them.

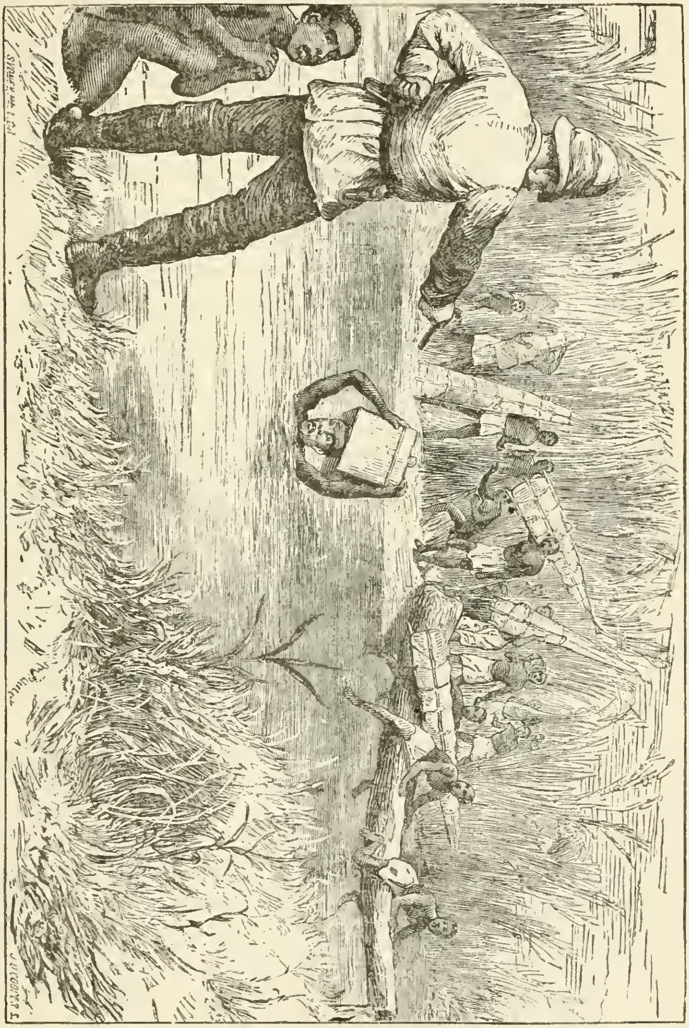
Even among the islands they were in frequent danger, and on one occasion had to make a night expedition to capture their enemy's canoes, to prevent being chased and attacked in the morning. It seemed impossible to enter into friendly relations with them; try what efforts they might the travelers found it useless, and were compelled literally to fight their way through miles and miles of desperate foes. Not one moment, day and night, did they feel safe from the flying and deadly arrow; they were obliged to keep constantly on the alert, their weapons by their side, ready for prompt and instant use. When they pitched their camp it was necessary to erect a strong stockade of stout poles, to guard their temporary quarters, before they could feel in any sense secure. An incessant watch was kept, and those who lay down to rest were never sure but the next minute savage cries would rouse them to immediate action.

AN OBSTINATE BATTLE WITH DIFFICULTIES.

Once during this terrible voyage they landed at the village of a friendly tribe, who they found possessed four muskets, gained from the west coast; here they were able to purchase a plentiful supply of provisions. Three days after they came to a powerful tribe, all armed with muskets, who, as soon as they saw them, manned no less than fifty-four large canoes, and attacked them. It was in vain that Mr. Stanley called out to them that they were friends, and offered them presents. It was not until he had lost three of his men that he gave the order to return their fire. For no less than twelve miles had they to fight their way. This was the most obstinately contested of the thirty-two battles fought on that terrible river. To quote from Stanley: "It was not until we had entered the valley of the Mukondokwa River that we experienced anything like privation or hardship from the high water. Here the torrents thundered and roared; the river was a mighty brown flood, sweeping downward with an almost resistless flow. The banks were brimful, and broad nullahs were full of water, and the fields were inundated, and still the rain came surging down in a shower, that warned us of what we might expect during our transit of the sea-coast region. Still we urged our steps onward like men to whom every moment was precious—as if a deluge was overtaking us. Three times we crossed this awful flood at the fords by means of ropes tied to trees from bank to bank, and arrived at Kadetamare, a most miserable, woe-begone abode of human beings; and camped on a hill opposite Mount Kibwe, which rose on the right of the river—one of the tallest peaks of the range. Finally we arrived at the mouth of the Mukondokwa Pass, out of which the river debouches into the plain. We knew that it was an unusual season, for the condition of the country, though bad enough the year before, was as nothing compared to this year. Close to the edge of the foaming, angry flood lay our route, dipping down frequently into deep ditches, wherein we found ourselves sometimes up to the waist in water, and sometimes up to the throat. Urgent necessity impelled us onward, lest we might have to camp at one of these villages until the end of the monsoon rains; so we kept on, over marsh bottoms, up to the knees in mire, under jungly tunnels dripping with wet, then into sloughs arm-pit deep. Every channel seemed filled to overflowing, yet down the rain poured, beating the surface of the river into yellowish foam, pelting us until we were almost breathless. Half a day's battling against such difficulties brought us, after crossing the river, once again to the dismal village of Mvumi. We passed the night fighting swarms of black and voracious mosquitoes, and in heroic endeavours to win repose in sleep, in which we were partly successful, owing to the utter weariness of our bodies.

THREATENING A FOOLHARDY NATIVE WITH A REVOLVER.

Next day we struck out of the village of Mvumi. It had rained the whole night, and the morning brought no cessation. Mile after mile we traversed, over fields covered by the inundation, until we came to a branch river-side once again, where the river was narrow, and too deep to ford in the middle. We proceeded to cut a tree down, and so contrived that it should fall right across the stream. Over this fallen tree the men, bestriding it, cautiously moved before them their bales and boxes; but one young fellow, Rojab—through over-zeal, or in sheer madness—took up Livingstone's box which contained his letters and journal of his discoveries on his head, and started into the river. I had been the first to arrive on the opposite bank, in order to superintend the crossing, when I caught sight of this man walking in the river with the most precious box of all on his head. Suddenly he fell into a deep hole, and the man and box went almost out of sight, while I was in an agony at the fate which threatened the despatches. Fortunately, he recovered himself and stood up, while I shouted to him, with a loaded revolver pointed at his head, "Look out! Drop that box, and I'll shoot you." All the men halted in their work while they gazed at their comrade who was thus imperilled by bullet and flood. The man himself seemed to regard the pistol with the greatest awe,



"YOU DROP THAT BOX AND I'LL SHOOT YOU."

and after a few desperate efforts succeeded in getting the box safely ashore. As the articles within were not damaged, Rojab escaped punishment, with a caution not to touch the box again on any account, and it was transferred to the keeping of a sure-footed porter.

From this stream, in about an hour, we came to the main river, but one look at its wild waters was enough. We worked hard to construct a raft, but after cutting down four trees and lashing the green logs together, and pushing them into the whirling current, we saw them sink like lead. We then tied together all the strong rope in our possession, and made a line one hundred and eighty feet long, with one end of which tied around his body, a man was sent across to lash it to a tree. He was carried far down the stream, but being an excellent swimmer, he succeeded in his attempt. The bales were lashed around the middle, and heaved into the stream, were dragged through the river to the opposite bank, as well as the tent, and such things as could not be injured much by the water. Several of the men, as well as myself, were also dragged through the water; each of the boys being attended by the best swimmers; but when we came to the letter-boxes and valuables, we could suggest no means to take them over. Two camps were accordingly made, one on each side of the stream; the one on the bank which I had just left occupying an ant-hill of considerable height; while my party had to content itself with a flat, miry marsh. An embankment of soil, nearly a foot high, was thrown up in a circle thirty feet in diameter, in the centre of which my tent was pitched, and around it booths were erected.

It was an extraordinary and novel position that we found ourselves in. Within twenty feet of our camp was a rising river, with flat, low banks; above us was a gloomy, weeping sky; surrounding us on three sides was an immense forest, on whose branches we heard the constant pattering rain; beneath our feet was a great depth of mud, black and loathsome; add to these the thought that the river might overflow, and sweep us to utter destruction.

NOVEL METHOD OF CROSSING A RIVER.

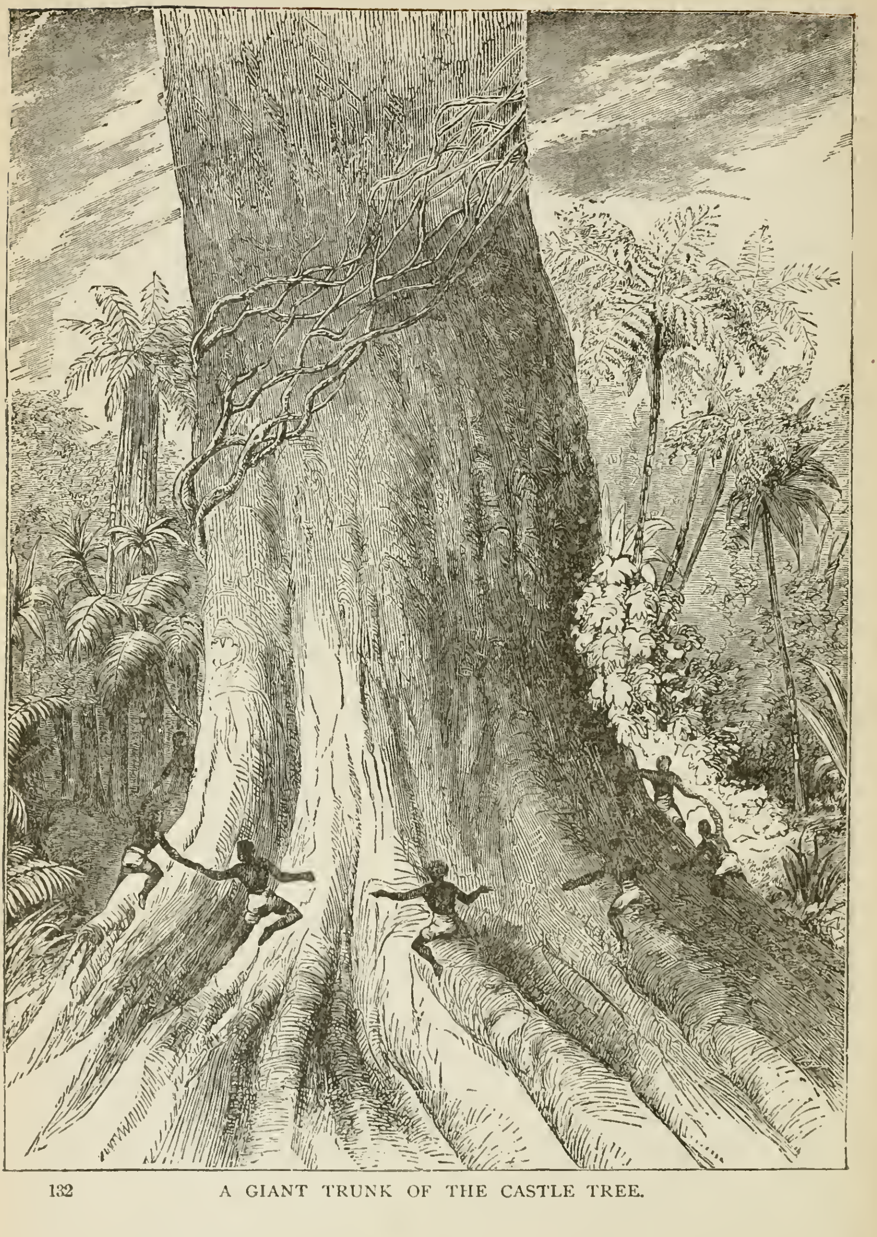
In the morning the river was still rising, and an inevitable doom seemed to hang over us. There was yet time to act—to bring over the people, with the most valuable effects of the expedition—as I considered Dr. Livingstone's journal and letters, and my own papers, of far greater value than anything else. While looking at the awful river an idea struck me that I might possibly carry the boxes across, one at a time, by cutting two slender poles, and tying cross sticks to them, making a kind of hand-barrow, on which a box might rest when lashed to it. Two men swimming across, at the same time holding on to the rope, with the ends of the poles resting on the men's shoulders, I thought, would be enabled to convey over a seventy pound box with ease. In a short time one of these was made, and six couples of the strongest swimmers were prepared, and stimulated with a rousing glass of stiff grog, with a promise of cloth to each man also if they succeeded in getting everything ashore undamaged by the water. When I saw with what ease they dragged themselves across, the barrow on their shoulders, I wondered that I had not thought of the plan before. An hour after the first couple had gone over, the entire Expedition was safe on the eastern bank; and at once breaking camp, we marched north through the swampy forest which in some places was covered with four feet of water. Glad indeed the wearied explorers were when they at length reached tribes who were friendly to white men, and more glad still when they saw the waters of the broad Atlantic spreading out before them, and knew that all danger was now over.

While Stanley was fighting his way down the Lualaba to the Atlantic, Lieutenant Cameron was making his famous journey from the east to the west coast of the great African continent. His intention was to convey assistance to Livingstone, and it was only while on his journey that he heard of his death. After having organized his expedition, he left Zanzibar for Bagamoyo, the point of departure for caravans bound to Unyanyembé and countries beyond.

Cameron's expedition, although starting from the same point as Stanley's, took quite a different route—one that led between that of the American and the Kingani river, a country open and park-like, varied with woodlands and jungle. But as no villages lay in his path, he was soon obliged to leave it, and make his way across the Usagara Hills, which, he says, in spite of their rocky character, are wooded to the tops, chiefly with acacias. Here he saw the paramasi tree—one of the noblest in the world, having a trunk sometimes fifteen feet in diameter, and ascending as high as one hundred and forty feet, with a bark of tender yellowish green, crowned by a spreading head of dark green foliage.

CAMPING UNDER GIGANTIC TREES.

In this latitude the traveler will first meet with the gigantic and castle-like Uwana, which is decidedly the most striking and wonderful tree among the thousands which adorn the South African forests. It is chiefly remarkable on account of its extraordinary size, actually resembling a castle or tower more than a forest-tree. Throughout the country of Bamangwato the average circumference of these trees was from thirty to forty feet; but on continuing researches in a north-easterly direction throughout the more fertile forests, which clothe the boundless tracts through which the fair Limpopo winds, one may meet with specimens of this extraordinary tree averaging from sixty to one hundred feet in circumference, and maintaining this thickness to a



A GIANT TRUNK OF THE CASTLE TREE.

height of from twenty to thirty feet, when they diverge into numerous goodly branches, whose general character is abrupt and horizontal, and which seem to terminate with a peculiar suddenness. The wood of this tree is soft and utterly unserviceable. The shape of the leaf is similar to that of the sycamore tree, but its texture partakes more of the fig-leaf; its fruit is a nut, which in size and shape resembles the egg of the swan. A remarkable fact in connection with these trees is the manner in which they are disposed throughout the forest. They are found standing singly, or in rows, invariably at considerable distances from one another, as if planted by the hand of man, and from their wondrous size and unusual height (for they always tower high above their surrounding compeers), they convey the idea of being strangers or interlopers on the ground they occupy.

Over these hills Cameron made his way to the Mpwapwa country, which in some portions of his route proved to be quite parched and dusty from scarcity of water; the vegetation, too, from the same cause, scanty and dry. But when the river of the same name was reached, things presented a more cheerful aspect. On both sides grew very large trees; so large indeed did some prove that the travelers pitched all their tents under one so enormous that one half was an ample shelter. Here provisions were found to be very dear, in consequence of a mountain tribe, called the Wadirigo, lording it over the people, and placing the villages under contribution. This plundering tribe are described as a tall and manly race, satisfied with having a string of beads round the neck or wrist, to serve as a substitute for clothing. They carry very large shields made of hide, a heavy spear for close quarters, and a bundle of slender assegais, which they throw with great force and precision to a distance of more than fifty yards.

THIEVES WITH IMMENSE EARS.

From Mpwapwa our traveler passed into Ugogo country, the inhabitants of which—the Wagogo—have the character of being great thieves and extortioners. They have a singular custom of piercing their ears, and enlarging the lobes so enormously that they sometimes fall as low as the shoulders. Ear-rings of brass and wire, pieces of wood, and other articles are worn in them. Their wool is twisted into strings, lengthened by fibres of the baobab, and at the end of these strings are attached colored beads or little brass balls.

So on, through country after country, Cameron traveled, his standard-bearers and other followers giving him much trouble and annoyance. But in spite of troubles and vexations, he made his way to Unyanyembé, and from thence, making a long *détour* southward, to avoid a restless chieftain named Mirambo, he reached Uganda, "country of farms," and then, soon after, stood on the heights of Ukaranga, "the country of the ground-nuts," and looked on the broad expanse of Lake Tanganyika. After navigating the southern end of this great lake, he journeyed to Nyangwé, and from thence through one thousand two hundred miles of a country never before seen by white man.

The great kingdom of Urua was the first country in this new land to claim his attention. It is larger in extent than even Great Britain and Ireland, and has one sole ruler, King Kasongo, who exercises a truly despotic sway. This kingdom is divided into districts governed by a kilolo, or captain, who derives his authority from the king; and the punishments inflicted for various crimes are those of death and mutilation. The people tattoo themselves, and their hair is carefully drawn back and tied behind the head, whence it sticks out like the handle of a saucepan. The males of Urua light their own fires and cook their own food, but will never allow another to see them eating, as they consider the sight unseemly; and should any one be present when they convey food to their mouth, they hold a cloth before the face. The different degrees of rank are carefully observed, and one of inferior social position dare not sit down in the presence of one more exalted without suffering punishment. The religion of the people is of a very degraded character, being a mixture of fetish and idolatry; every village possesses a devil-hut and an idol, before which offerings of meat and grain are placed. Small figures are also worn round the neck. In addition to these, the kingdom possesses one grand deity named Kungwé-a-Banza, who is considered all-powerful for good or evil. The temple of this god is placed in a clearing of a jungle, and guarded by a number of priests, who, however, are never allowed to see it—a privilege only accorded to the idol's wife, who is always a sister of the reigning king. To test the supposed feelings of awe and fear in which this idol was held by the common people, Cameron on several occasions went softly behind a man and cried suddenly, "Kungwé-a-Banza!" The man invariably gave a spring into the air and darted away with every symptom of dread.

SINGULAR CUSTOMS AT THE BURIAL OF A CHIEF.

At Kilemba, the chief residence of the king, Cameron was delayed for a long time as a prisoner, being only allowed to make short excursions into the country. Most of his time was spent in gathering information as to the manners and customs of the people, many of which proved to be of a cruel and savage nature.

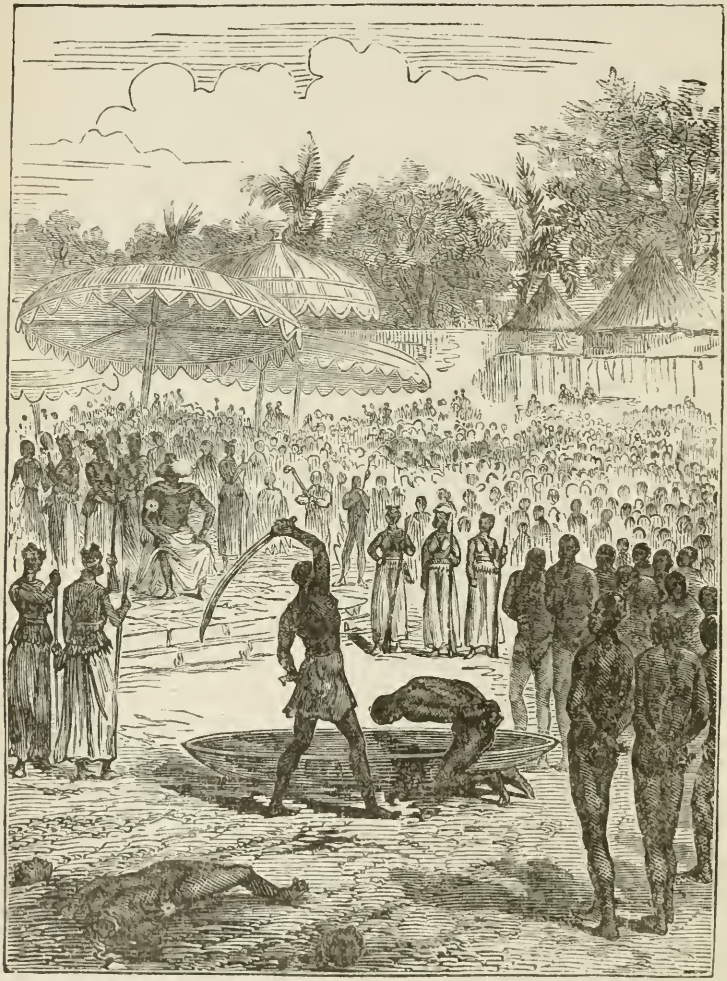
The first proceeding in the burial of a king is to divert the course of a stream, and in its bed to dig an enormous pit, the bottom of which is then covered with living women. At one end a woman is placed on her hands and knees, and upon her back the dead chief, covered with his beads and other treasures, is seated, being supported on each side by one of his wives, while his second wife sits at his feet. The earth is then shoveled in on them, and all the women are buried alive with the exception of the second wife. To her, custom is more merciful than to her companions, and grants her the privilege of being killed before the huge grave is filled in. This being completed, a number of male slaves—sometimes forty or fifty—are slaughtered, and their blood poured over the grave, after which the river is allowed to resume its course. Smaller chiefs have only two or three wives buried with them, and but few slaves killed over the grave; while one of the common people is buried alone in a sitting posture, his right forefinger pointing to the sky.

When the chiefs are summoned to pay homage to their king, the ceremony takes place in the courtyard of the royal settlement, or Mussumba, the entrance being carefully guarded by sentries, and a porter clothed in a leopard skin and armed with a huge club. Kasongo stands with his spear in his hand, while behind him are women carrying his shields, and one an axe. A chief approaches, followed by a slave, holding an axe before his face with the edge presented to the king. When within a given distance, he rushes suddenly forward, as if with the intention of slaying his ruler; then, as suddenly stopping, he falls prone to the ground, burying his face in the dust, and throwing some on his head. This same ceremony is repeated by all the chiefs present.

King Kasongo's rule was very despotic; no village was safe while he reigned, and when maddened by smoking and drinking bhang he was capable of committing acts of great cruelty. On one occasion a chief paid him the customary taxes of the village. The king professed great friendship for him, and, to do him honor, said he would accompany him back. When the village was reached, a cordon of men were stationed round it, and at night the chief was compelled with his own hands to fire the huts of the sleeping people, and was then killed. The inhabitants, aroused by the fire, rushed from their dwellings to plunge into the jungle for safety, but the troops placed on the outside of the village slew every man, while the women and children were taken away for slaves. Such things can these barbarous kings do, murdering by the wholesale their defenceless subjects.

Mr. Cameron paid this potentate a visit, and he describes his settlement as being six hundred yards long and two hundred yards wide, fenced round with sticks five feet high, and lined with grass. The interview was brief and of a formal character, but when the traveler took his leave the king's band accompanied him, playing all the way.

While detained a prisoner, Cameron made an excursion to Lake Mohrya, to the north of the capital—a small sheet of water surrounded by wooded hills, but having within it three curious villages built on piles, a platform being laid on these and the huts raised on the platform. Some of these huts were of an oblong shape, others round, with sloping roofs. The people live entirely in these huts with their domestic animals, very seldom coming to shore, and then merely for



HUMAN SACRIFICES IN THE KASONGO COUNTRY.

the purpose of cultivating patches of ground and to feed their goats. Men were seen swimming from one village to another, although it was said that large snakes inhabit the water, whose bite is fatal.

A QUAINT OLD LEGEND.

In an excursion to the south, Cameron discovered Lake Kassali, concerning the origin of which the people told him the following:—

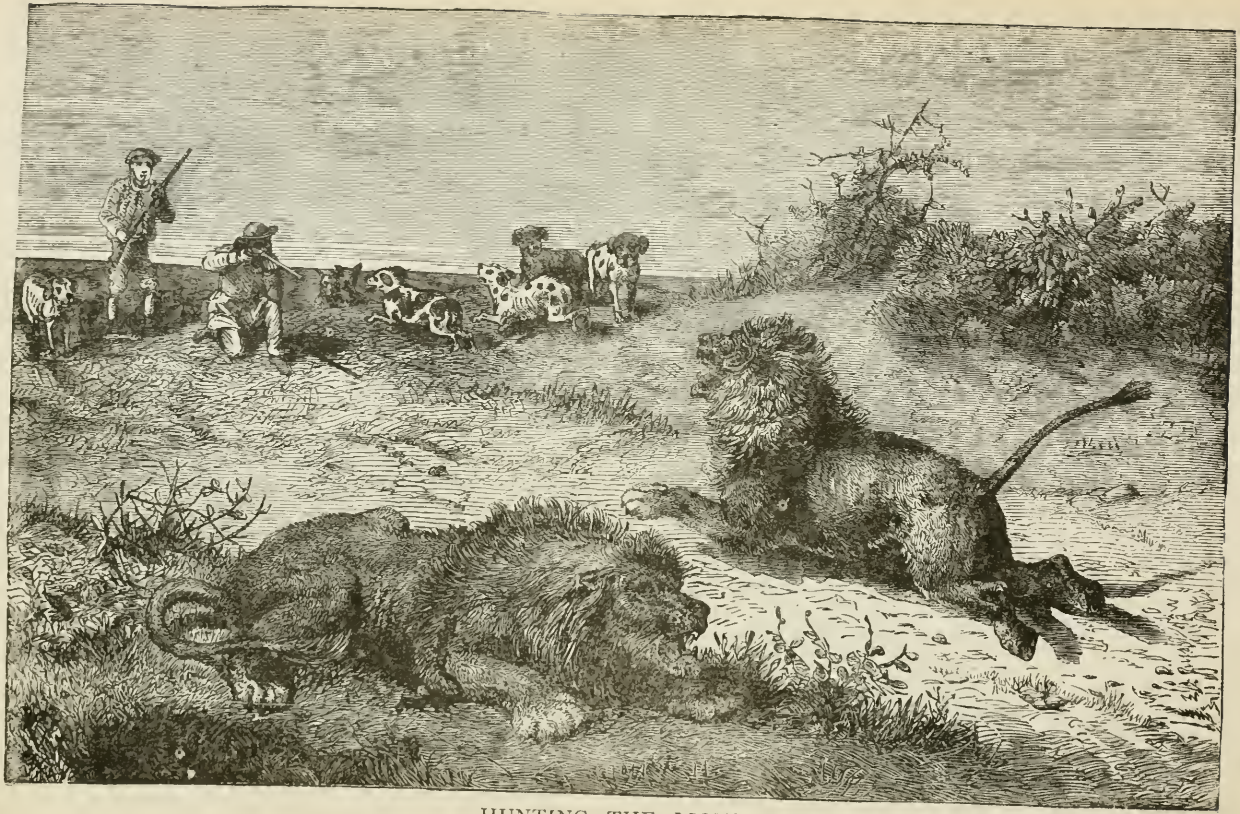
Once there stood, where Lake Dilolo now is, a large and prosperous village. The inhabitants were all rich and well-to-do, possessing large flocks of goats, many fowls and pigs, and plantations of corn and cassava far exceeding anything that is now granted to mortals. They passed their time merrily in eating and drinking, and never thought of the morrow. One day, an old and decrepit man came into this happy village, and asked the inhabitants to take pity on him, as he was tired and hungry, and had a long journey to travel. No one took any notice of his requests, but he was instead pursued with scoffs and jeers, and the children were encouraged to throw dirt and mud at the unfortunate beggar and drive him out of the place.

Hungry and footsore, he was going on his way, when a man more charitable than his neighbors accosted him and asked him what he wanted. He said all he wanted was a drink of water, a little food, and somewhere to rest his weary head. The man took him into his hut, gave him water to drink, killed a goat, and soon set a plentiful mess of meat and porridge before him, and when he was satisfied gave him his own hut to sleep in.

In the middle of the night the poor beggar got up, and aroused the charitable man, saying, "You have done me a good turn, and now I will do the same for you; but what I tell you none of your neighbors must know." The charitable man promised to be as secret as the grave, on which the old man told him that in a few nights he would hear a great storm of wind and rain, and that when it commenced he must arise and fly with all his belongings. Having uttered this warning, the beggar departed. Two days afterward the charitable man heard rain and wind such as he had never before heard, and said, "The words that the old man spoke are true." He got up in haste, and with his wives, goats, slaves, fowls, and all his property, left the doomed place safely. Next morning, where the village had stood was Lake Dilolo; and to the present day people camping on its banks, or crossing in canoes on still nights, can hear the sound of pounding corn, the songs of women, the crowing of cocks, and the bleating of goats.

LIONS WALKING THE VILLAGE STREETS.

It was here, too, that our traveler heard of the village where the people were on friendly relations with lions, which walked about the



HUNTING THE LIONS.

streets as dogs do, and that on certain festival days, when they were feasted, as many as two hundred at a time would visit the village and each answer to a name. He was also told of a people who lived in underground dwellings which were situated in immense caverns on the banks of the river Lufira, where there were whole villages and their chiefs, and that the people very seldom visited the upper air. Then there was a mysterious island called Ngornanza, somewhere on Lake Tanganyika, where the inhabitants were all afflicted with the leprosy, and not allowed to leave the island or intermarry with any other tribe; and that when the natives of the surrounding country were compelled by business to pass through its villages, they did so hurriedly, with their mouths covered and their eyes averted. Many other marvelous stories were related.

After a lengthened stay at the capital of the Urua country, King Kasongo was at length pleased to give our traveler permission to depart, of which he was glad to avail himself. Journeying across Ulunda from east to west, he entered the countries of Lovalé and Kibokwé, in the first of which he found the people very savage, and, possessing guns, were much feared by passing caravans, as they made many claims upon them and extorted large tribute; and as the fetish men are all-powerful in this country, the stranger was compelled to keep a sharp look-out and be careful of his actions, for should he chance to rest his gun against a hut in one of their villages, it was instantly seized, and not returned unless a heavy fine was paid; for it was maintained that it was an act of magic, intended to cause the death of the owner of the hut. These people dress their hair in a very singular fashion, by plaiting it into a kind of pattern, and then plastering it with mud and oil, till the head-dress looks as if carved out of wood.

CHAPTER V.

EXPLORATIONS OF DU CHAILLU, SPEKE, GRANT, AND OTHER CELEBRATED TRAVELERS.

Handsome Savages—Penetrating the Wilderness—The Muni Men—Horrible Customs—A Stampede of Gorillas—King of the Cannibals—Monkey Ingenuity—Slaughter of Witches—King Du Chaillu—A Chimpanzee—Boa-constrictors—Small-pox—Otando Land—A Race for Life—Speke and Burton—A Strike—Robbers—"A Stumpy Old Dame"—Grant's Exploits—Wife Fattening—Mtesa, the Greatest of African Kings—Human Sacrifices—Great King Munza.

PAUL DU CHAILLU, an American by birth, but a Frenchman by parentage, between 1856 and 1859, traversed the regions of Africa on the line of the equator, and made scientific discoveries of great importance.

A second journey, in which Ashango Land was visited, and the most westerly buttresses examined of the great mountain range supposed to divide the continent of Africa nearly along the line of the equator, was also fruitful of results, and the two expeditions may be looked upon as steps towards the realization of that dream of the present age, the connection of the eastern and western coasts of Central Africa, a dream now become almost a waking reality by the conclusion of Lieutenant Cameron's and Stanley's world-famous journeys.

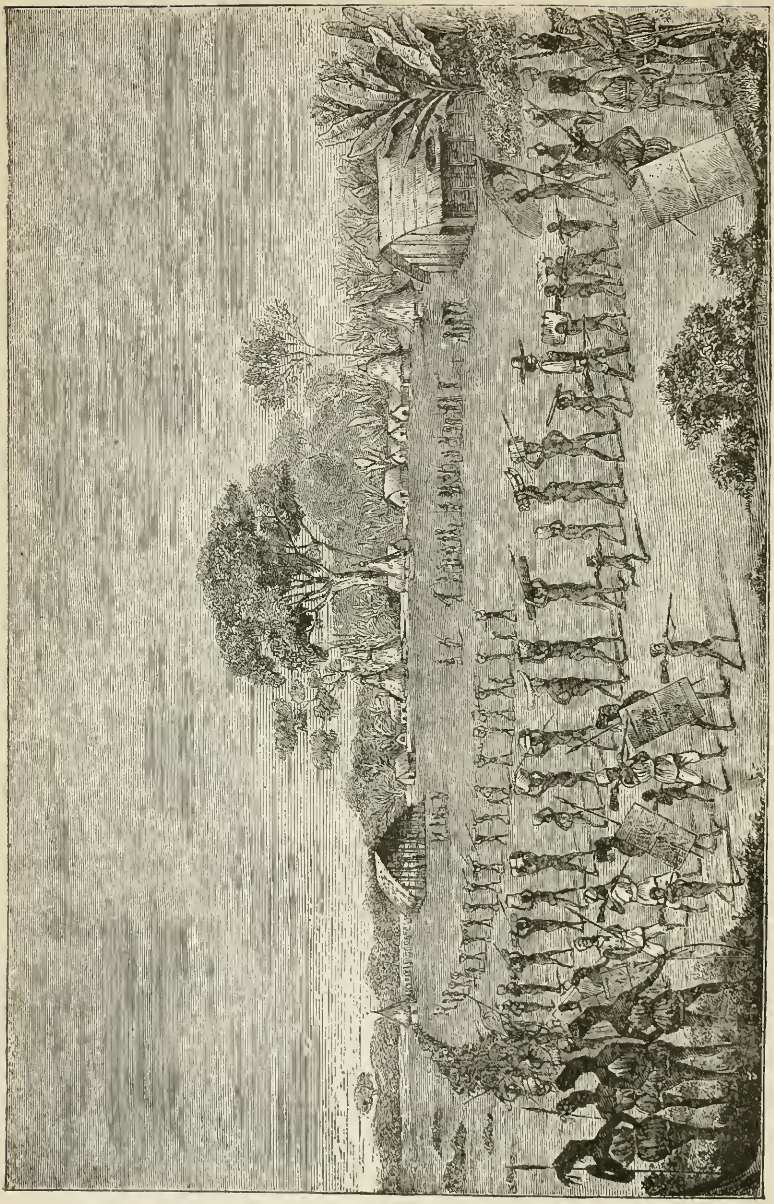
Du Chaillu, whose expenses were paid by a Philadelphia scientific society, arrived at the mouth of the Gaboon River, already dotted with missionary settlements, early in 1856, having, in several years' residence on the coast as a trader, acquired considerable experience in dealing with the Mpongwes, the chief native tribe of the coast districts. Being anxious to harden himself to the climate of the interior, so often fatal to the white man, he took up his quarters at Baraka, eight miles up the river, the station of an American mission founded about 1842. Here our hero was most hospitably entertained, and the early part of his narrative is occupied in describing the results already achieved by the little band of Christian teachers there at work, who devoted most of their time to the instruction of the children, teaching them to read the Scriptures in their own language, and to master the first principles of geography and arithmetic. They hoped, by these means, gradually to change the whole character of the Mpongwe race, many members of which have good intellectual ability.

Here the antecedents of the natives were carefully studied, and according to Du Chaillu, the Mpongwe are but one branch of a great negro family which has moved gradually down from the interior to the sea-coast, taking the place of other tribes, the Ndina, for instance, who have disappeared—we might almost say melted away—in that mysterious way peculiar to native races, leaving scarcely a trace of their existence. The Mpongwes are a fine-looking sturdy set of men, resembling in their general appearance the Mandingoes, so often met with in our travels further north. Eager traders, they and their neighbors to the north-west, the Shekiani and others, mistrust all explorers who seem likely to interfere with their gains, and only by repeated assurances of his innocence of any such intention was our hero able to obtain permission to traverse their country, and even then, many of the merchants with whom he had done a brisk business in ivory and dyes, in former times, tried to scare him from visiting the interior by terrible stories of the ferocity of the cannibal tribes living to the east, and of the untamable gorillas and other wild beasts haunting the impenetrable forests and impassable swamps.

OFF FOR THE WILDERNESS.

Nothing daunted by all he heard, but more eager than ever to see and judge for himself, our hero sailed from the Gaboon early in April, 1856, intending first to explore the Muni, flowing into the Atlantic, and for this purpose he landed at Corisco Island, situated in the bay of the same name, where he was to obtain canoes and men to help him to ascend the river. Here, as at Baraka, Du Chaillu's hosts were missionaries, who had three important stations on the island, and had done much good work amongst the native Mbengas, formerly a warlike, quarrelsome race, but now quiet and peaceable converts to Christianity, retaining, however, many strange, superstitious, and cruel practices, the relics of their former faith.

Du Chaillu's efforts at Corisco resulted in his obtaining the escort of a certain chieftain named Mbango, who was to introduce him to an influential king on the Muni, and he started for that river in Mbango's canoe, with a crew of twelve negroes, all armed with guns, and a personal outfit of a chest containing one hundred fathoms of print, nineteen pounds of white beads, a quantity of small looking-glasses, steels and flints, a quantity of leaf-tobacco, eighty pounds of shot and bullets, twenty-five pounds of powder, and a few guns. Thus provided, he proposed penetrating to the very heart of the Sierra del Cristal, a chain running parallel with and about eighty or a hundred miles distant from the coast, between the equator and two degrees north latitude, visiting the cannibal tribes supposed to lead a wild life in those mountain fast-



THE EXPEDITION ON THE MARCH.

nesses, and ascertain if, as reported, the Congo continued its course in a north-easterly direction above the equator. How far this programme was realized our narrative will show.

A SUDDEN CHECK.

Passing in rapid succession the little islands of Leval, Banian, and Big and Little Alobi, dotting the bay of Corisco, the canoe was making rapid progress, when a detention suddenly occurred of a character so thoroughly African as to merit detailed relation here.

We must explain that Mbango was a very great trader, and, as such, the possessor of many creditors, who, like their compeers all the world over, were more ready to borrow than to pay. Now, as the little bark containing our hero and his sable attendants shot along, a large boat came slowly sailing towards it, which, when near enough for its inmates to recognize Mbango, was hurriedly put about, and paddled off, not quite quickly enough, however, for Mbango had already caught sight of an old debtor of his on board, and urging his men to put on all speed, he gave chase, shouting "Stop! stop!" and threatening to fire on the fugitives if he were not obeyed. In vain! At every shout the rowers on the larger vessel redoubled their efforts, and a few random shots from the canoe only frightened them still more. To make a long story short, the smaller and swifter vessel won the race; it was hauled alongside the enemy; a fierce hand-to-hand fight ensued, and the debtor's party, finding they were getting the worst of it, finally sprang into the water and swam off, leaving three prisoners, one a woman, in Mbango's hands. These, he coolly informed Du Chaillu—who throughout the scuffle had gesticulated and protested unnoticed—he should retain as hostages until he got some bar-wood for which he had paid in advance. That matter settled, the canoe's head was once more turned towards the Muni; but our hero, not quite so much accustomed to unexpected fights as his escort, was so exhausted as to be obliged to land on the island of Little Alobi, where he passed the night, and took some doses of quinine to ward off fever.

A NOISY WELCOME.

The next morning he was visited by several Muni men, and in the afternoon sailed with a favorable tide up the river for the village of Mbango's friend Dayoko. An uninteresting paddle of about forty miles brought our hero to Dayoko's village, a miserable collection of huts rising from a mud bank forming its chief protection from attacks from the river. The natives, roused from their "beauty sleep" by the arrival of the strangers, poured out armed with old muskets, expecting nothing less than a raid from the interior; but recognizing the friendly Mbangos, they flung down their arms, rent the air with shouts of welcome, and conducted them to the stranger's house, always kept empty for visitors.

Presently Dayoko himself appeared, followed by his numerous wives, all eager to stare at the white man, and the tedious ceremony of a so-called "salutation," inseparable from a West African welcome, ensued, Mbango making an oration, giving a most minute account of every incident of the trip from Corisco. Not until twelve o'clock was our weary hero allowed to enjoy either supper or bed.

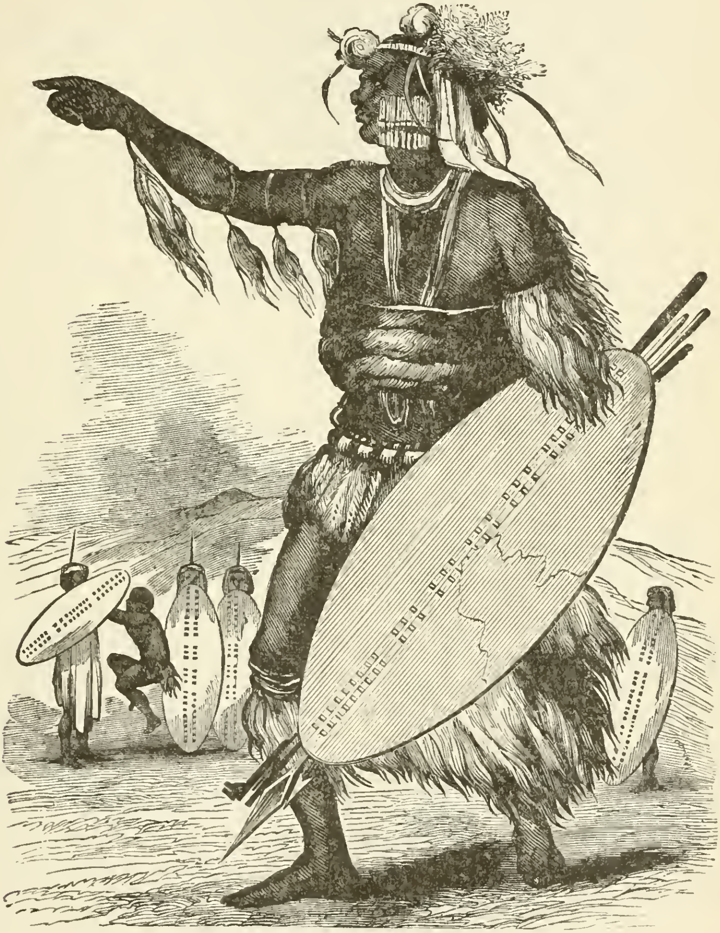
The next morning Du Chaillu had an early interview with Dayoko —who, in spite of the wretched appearance of his village, was the oldest and most influential chief of the Mbousha tribe—and consulted with him as to the best plan for carrying out his scheme of a journey into the Fan country beyond the Sierra del Cristal. As usual, the first reply was, "Impossible; you will die on the road; you will be murdered by the cannibals, and eaten; there is war on the river, and the tribes will not let you pass; the country is sick." To all this Du Chaillu merely answered that his mind was made up; he would go, and if not with Dayoko's people, then with some one else.

HORRIBLE PRACTICES.

This settled the matter; the Mbousha chieftain promised his protection, and it was arranged that after a few days' rest our hero should go on with some of his men to Mbene's village, a little further up the river, and there obtain natives for his proposed journey into the interior. The interval of waiting was employed partly in hunting and partly in examining the beautiful flora of the banks of the river, but just before leaving the village, Du Chaillu's favorable impression of his hosts received a severe shock, for, though not an eye-witness of the actual deed, he saw all the attendant horrors of the murder of a poor old negro, said to be a great wizard, and to have done much harm. In vain did the white man plead his cause with Dayoko; he was dragged down to the river, and there literally hacked to pieces by some half-dozen of his fellow-countrymen.

Dayoko's men were sent home, and Mbene, having agreed that his brother Ncomo and some of his own men should accompany the explorer as far as the Fan country, Du Chaillu resigned himself to wait till the party should be collected. In the latter part of August the start was made for the Sierra del Cristal, the party this time consisting of Du Chaillu, the Ncomo already mentioned, two of Mbene's sons, named Miengai and Maginda, a young man named Pouliandai, and half-a-dozen sturdy Mbondemo women to carry the baggage. A walk of a few miles brought the expedition to a table-land some six hundred feet high and three miles long, strewn with masses of quartz and granite, passing which another tier of hills, steeper and higher than the first, had to be climbed. The path was crooked, poorly marked, and wound about in devious courses, rendering their progress very difficult.

Following his guides, who, he tells us, scudded up the rocks like monkeys, clinging to every little foothold with their bare, supple toes, in a manner impossible for him to imitate in his heavy shoes, Du Chaillu was about to begin the ascent of this second tier, when Miengai suddenly made him a sign to pause. He had probably caught sight of a herd of elephants or of a tiger, and cocked his gun in readiness to fire, his master following his example. Five minutes of breathless silence followed, and then a long, loud hurrah rung out, answered by shouts



A CHIEF IN WAR COSTUME.

from the rocks and trees around. What could it be? No elephant, no tiger was ever greeted in such wise. Du Chaillu was still looking about him in wonderment, when Miengai raised the fierce war-cry of his nation and darted forward, his master close behind him. Another moment and the mystery was explained, for our hero came in sight of an encampment of Mbene's people on their way home from a trading expedition to the interior. There lay some hundred weary black men taking their ease about their fires, whilst their women cooked and slaved for them, and their children gathered sticks and branches. Pitching his own camp near them, Du Chaillu allowed his men to fraternize with their comrades, and did not resume his march the next morning till they had started for home; the men carrying only their arms, the women and children staggering under the weight of the baskets of india-rubber and ivory, and constituting the beasts of burden for the journey.

TROUBLE IN THE CAMP.

A tramp of eighteen miles through rain and mud, and up a continuous ascent, brought our explorer late on the same day to a large Mbondemo encampment in the hills, where he made himself comfortable, and indulged in a good, long rest before he began the ascent of the second range of the Sierra del Cristal. Here, however, he had some little difficulty with his men, who declared they would not go a step further unless he paid them more cloth. Putting a bold face on the matter, though to have been deserted then would have been certain death, our hero went amongst the mutineers, pistol in hand, declaring that he would give them nothing more, nor would he permit them to leave him, for had not their father, Mbene, given them to him to go with him to the Fan tribe? They must go on, or—here followed a demonstration with the pistol—there would be war to the death between them and their master.

This steady demeanor had the desired effect; the men wavered, consulted together, withdrew their threats and their demands, and shaking hands with Du Chaillu, promised fidelity and friendship. The ascent of the second range of the Sierra del Cristal began, and struggling up and up through a wild country, densely wooded and apparently untenanted by a single living creature, they came about midday to the head waters of the Ntambounay, dashing down hill in the form of a mountain torrent, extending for a mile, right before the explorer, like a vast seething billowy sea. Pausing but to drink a few handfuls of the pure, clear water, Du Chaillu pressed on, and an hour's further ascent brought him to a clearing once occupied by a Mbondemo village, on the very summit of the range, some five thousand feet above the sea-level, from which he had an uninterrupted view of the hills ascended the day before, and the apparently endless virgin forests on the west, whilst far away in the east loomed the blue tops of the farthest heights of the Sierra del Cristal, reminding him that his work was as yet but begun.

Roused from a dreamy reverie by the yells of his men at the discovery of a snake, which they killed and ate on the spot, Du Chaillu was seeking about the ruins of the village for something to satisfy his own hunger, when he saw the unmistakable traces of the recent passage of gorillas in patches of beaten-down, torn-up, and chewed sugar-cane.

A GORILLA HUNT.

Joy, he tells us, filled his heart at the sight, and, calling his men together, he ordered some to remain and protect the women, and others to join him in following the tracks. Armed to the teeth, and not daring to speak, for the gorilla is keen of hearing and prompt in action, the hunters crept cautiously along, descended a hill, crossed a stream on a fallen log, forced their way through the dense bush on the other side, and were finally rewarded by the sight of four young gorillas speeding along on their hind legs, their heads down, their bodies inclined forwards, looking like hairy men running for their lives. Fierce, discordant, half-human, half-devilish cries testified to their alarm and distress; but though a perfect volley was fired at them, they got off unhurt, and were careful not to show themselves again.

Feeling rather crestfallen at their ill success, the party returned to the camp to find large fires burning as a protection from the gorillas, and their supper ready cooked. Refreshed by a night's rest, they made another expedition with no better results the next day, and then, provisions being exhausted, they were compelled to resume their march, a heavy day's tramp along a mere elephant track bringing them to a deserted village, where they were presently joined by some Mbichos from a neighboring settlement, who had never before seen a white man, and expressed the greatest astonishment at Du Chaillu's appearance. Plantains were the only food they could spare for their famishing guests, but the next day our hero's old friend Mbene arrived, who at once set off to a Fan village near to obtain provisions.

A STARTLING MEETING.

Unable to bear the pangs of hunger until Mbene's return, Du Chaillu took his gun and started to meet him, hoping to be able to shoot something on the way. Giving chase to a monkey, which dodged him whenever he took aim, he became separated from his escort, and came suddenly face to face with a Fan warrior and two Fan women, his wives. Startled at this unexpected apparition, our hero was about to beat a retreat, when it dawned upon him that the blacks were as much alarmed as himself, and it subsequently transpired that they took him for a spirit fresh from the sky. Smiling and looking as pleasant as he could, he advanced close to the sable warrior, who seemed ready to sink into the ground with fright, and at this juncture the Mbondemo people came up, mutual explanations ensued, Du Chaillu gave the women some strings of white beads, and the Fan trio went off highly delighted. These, the first acquaintances made by a European in Fan country, were tall, strong, active-looking people, with skins rather less dark than those of their sea-coast neighbors, woolly hair drawn out into long thick plaits, high cheek bones, prominent lips, and large black deep-set eyes. They wore the minimum of clothing—nothing more, in fact, than a piece of the soft inside bark of a tree covered with the skin of a wild cat or tiger, and hung round the waist.

ASTONISHMENT AT A WHITE MAN.

The news of the arrival of a white man soon spread through the neighborhood, and Du Chaillu was presently mobbed by a crowd of men and women, who touched everything he had on, and were especially astonished at the appearance of his feet, taking his thick boots for a new variety of limb. Being anxious to impress his admirers with his power as well as his beauty, and knowing only too well that their enthusiasm would not prevent his being killed and eaten should opportunity offer—for the Fans are undoubtedly cannibals—Du Chaillu shot two swallows on the wing in their presence, a feat which they thought more wonderful than anything else. At four o'clock, much to the weary explorer's delight, he was at last left alone, his visitors promising to send him plenty of fowls on the morrow. This they did, and, the claims of exhausted nature being at last satisfied, our hero lost no time in beginning the gorilla-hunting, which was one of the secondary objects of his journey.

SHOOTING A GORILLA.

The first day one female only was wounded, and escaped, but the next, after pushing through a dense and all but impenetrable forest, the very home of a huge male was reached, and Du Chaillu found himself for the first time face to face with what he calls the "king of the African forest." Rising to his full height, nearly six feet, he glared upon the intruders with his large deep gray eyes, beating his fists upon his breasts, and barking like an angry dog. Motionless stood Du Chaillu, his gun pointed at the enemy's heart; motionless stood the Mbondemo warriors, a little further back, awaiting the onslaught which they knew would not long be delayed. Then, as the great beast dashed forward, with eyes flashing fire, to stop within six yards of his adversaries and utter a fearful roar of defiance, the word to fire was given, and with an almost human moan he fell forward on his face—dead! A few days after this successful hunt our hero moved on, by invitation, to a Fan village, and on his very first entrance saw unmistakable evidence of the existence of cannibalism in the human remains lying outside the houses, and a human thigh carried by a woman as indifferently as any poor person in our own country would take home the meat purchased at a butcher's.

THE KING OF THE CANNIBALS.

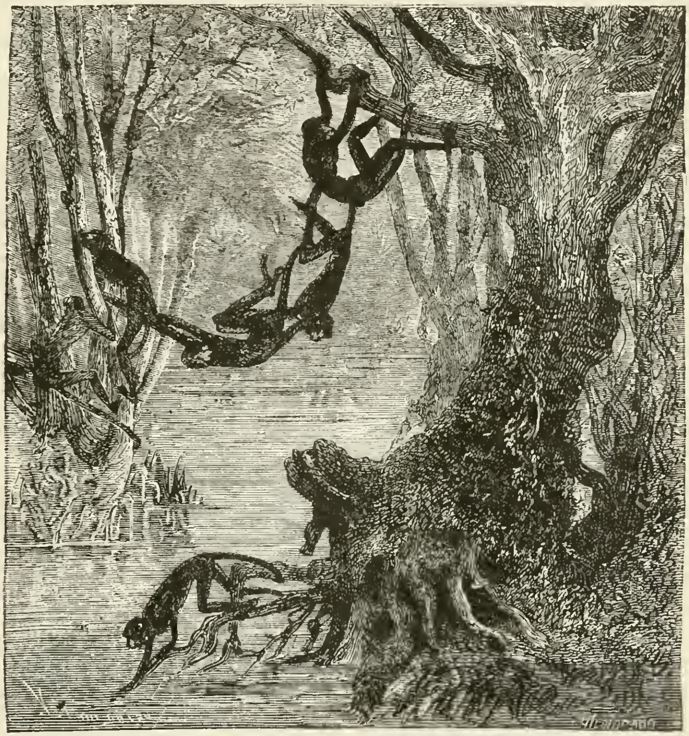
Arrived at the palaver-house, Du Chaillu had to wait a little time for an audience with the cannibal king, his majesty being engaged in superintending the division of a human body ; and when his host did arrive, escorted by a tumultuous crowd of warriors, he turned out to be a savage, ferocious-looking fellow, naked except for the small waist garment mentioned above, but tattooed with all manner of weird and fantastic designs. With Mbene as interpreter, Du Chaillu had a short and not very interesting talk with the king, who seemed rather afraid of him, and sent his queen to get a lodging ready for him with rather more alacrity than politeness. Only too glad to get away, the white man was soon ensconced in a small bark house with a roof of palm-leaf matting, and containing as a bed a rough bamboo frame, sleeping on which left him bruised and aching all over. The next morning, the first sight which met his eyes on opening the door of his hut was a pile of human ribs, leg and arm bones, and on taking a short stroll, fresh evidences of cannibalism stared him in the face at every turn. In spite of all these horrors, however, and the full conviction that he might any day himself fall a victim to the man-eating propensities of his hosts, the intrepid traveler remained some weeks in the village, joining in a grand elephant-hunt, witnessing a Fan wedding, and paying a visit to the neighboring Osheba tribe, greatly resembling the Fans, by whom he was very courteously received. He even contemplated penetrating further to the east, but he frankly owns that he was deterred by the stories, only too likely to be true, which he heard on every side of the bloodthirsty character of the cannibal tribes through which he would have to pass alone, Mbene being unable to accompany him further. He therefore determined to make at once for the coast, intending to go from there across country to Sangatanga, the head-quarters of the Oroungou tribe.

After a somewhat tempestuous voyage down the coast, our hero arrived at the mouth of the Fernand Vaz, the largest river of the Ogobai delta, and landing at a village in the dominions of King Ranpano, after that potentate and a neighboring chief had almost gone to war for the honor of entertaining him, he gave out that he had come to trade, and had a house built on a beautiful situation a little apart from the native huts. In April he took possession of his new home, to which he gave the name of Washington, and with an escort of Cammamen, whom he had bound to his service by judicious bribery, he started up the river Fernand Vaz in a fine canoe, for which he had paid some thirty dollars' worth of goods. Passing between dense tropical forests, tenanted by numerous monkeys with white whiskers, and amongst huge hippopotami, the party came in a couple of days to the important Camma village, Aniambia, the river running in the earlier part of its course parallel with the sea.

STRANGE ANTICS OF MONKEYS.

One could scarcely help laughing aloud at the odd manner in which the monkeys made their way among the branches, now swinging down by their tails, now catching another branch, and hanging on by their arms. .They were extraordinarily thin creatures, with long arms and legs, and still longer tails. Those tails of theirs were never quiet, but kept whisking about in all directions. They caught hold of the branches with them, and then hung by them with their heads downwards, an instant afterwards to spring up again. Presently they came close to the water, when one of them caught hold of a branch with his fore-hands and tail, another jumped down and curled his tail round the body of the first. A third descended and slung himself in a similar manner. A fourth and fifth followed, and so on; and there they hung, a regular monkey chain. Immediately the lowest, who hung with his head downwards, gave a shove with his fore-paws, and set the chain swinging, slowly at first but increasing in rapidity, backwards and forwards over the water. The swinging increased in violence, till the lowest monkey got his paws round the slender trunk of a tree on the opposite side. Immediately he drew his companions after him, till the next above him was within reach of it. That one caught the tree in the same way, and they then dragged up their end of the chain till it hung almost horizontally across the water. A living bridge having thus been formed, the remainder of the troop, chiefly consisting of young monkeys who had been amusing themselves meantime frisking about in the branches, ran over. Two or three of the mischievous youngsters took the opportunity of giving a sly pinch to their elders, utterly unable just then to retaliate; though it was evident, from the comical glances which the latter cast at them, that the inflictors of the pinches were not unnoticed. One, who had been trying to catch some fish apparently during the interval, was nearly too late to cross. The first two who had got across now climbed still further up the trunk; and when they had got to some distance, the much-enduring monkey, who had been holding the weight of all the others, let go his hold, and now becoming the lowest in the chain, swung towards the bank. As soon as he and his companions reached it, they caught hold of the trunk either with their hands or tails. The whole troop thus got safely across, having effected the transit by their wits and extraordinary agility.

On his return to Washington Du Chaillu found, to his great delight, that a young gorilla had been taken alive by his men, a little fellow of between two and three years old, two feet six inches in height. Hoping to be able to tame him, his master named him Joe, and shut him up in a strong bamboo hut built expressly for him, but the poor captive, unable to reconcile himself to his confinement, managed to force aside the stakes of his prison, and was found concealed under Du Chaillu's bed. A terrible scene ensued, the frightened beast being ready to tear to pieces every one who approached, but he was at last secured, and once more shut up, only to escape again, just as his master thought he was winning his affections by unwearying attentions. A third time he was secured, a light chain being now fastened to his neck; but this last indignity was too much for him, and he died miserably ten days afterwards.


CURIOUS MONKEY BRIDGE.

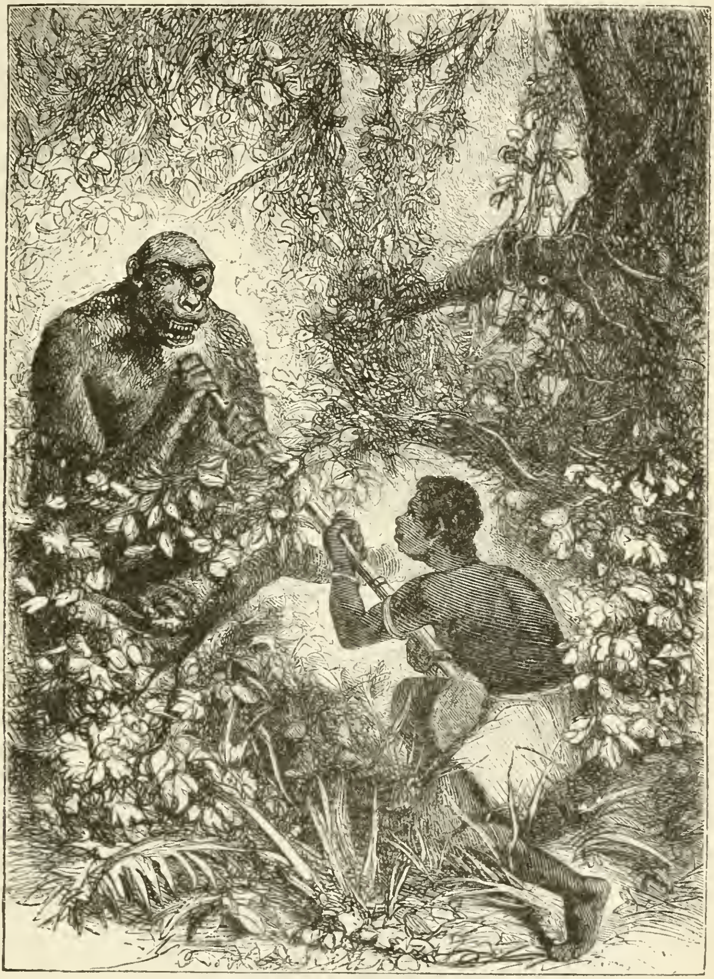
Poor Joe Gorilla being dead, Du Chaillu again started on his explorations. Soon after this he narrowly escaped death from poison administered by his cook, a native of Sangatanga, who was condemned to death for this offense by Ranpano, but begged off by Du Chaillu, who got his sentence commuted into the infliction of one hundred and ten lashes with a whip of hippopotami-hide. These were given with a severity appropriate to the serious nature of the offense.

TERRIBLE COMBAT WITH THE KING OF THE FOREST.

His health restored after all his sufferings, our hero started on a trip up the Rembo, a large river joining the Fernand Vaz, near its mouth, to pay a visit to King Quengueza of Goumbi, an important village some hundred miles from the sea-coast, and from thence he made his way in an easterly direction from one village to another to the Balakai country —inhabited by roving negro tribes, who lead a simple life, possessing no property but their wives and slaves, and showing marvelous courage in hunting the gorilla—which he scoured again and again on many an exciting expedition, including one in which a poor native was fatally injured. The actual conflict was not witnessed by Du Chaillu, but he came up with the victim just before his death, and the man related how he had suddenly come face to face with a huge male gorilla, who made no attempt to escape, and seemed very savage. He fired at a distance of about eight yards, but the ball only wounded the animal's side, and, roaring with rage, he began beating his breasts, and dashed upon his victim, knocking his gun out of his hand, and striking him a fearful blow with his open paw, which felled him to the ground. The gorilla then seized the gun, wrenched it out of all shape, and made off, leaving the native to die. The poor fellow lingered on for some days in great agony, and then expired. In another struggle with the fierce king of the forest, the man turned out to be the victor, his loaded gun going off in the gorilla's face before it could be rendered useless.

During a short necessary halt made at Goumbi, our hero was witness of a terrible execution, proving how savage were the hearts of the natives, in spite of their unfailing courtesy and kindness towards himself. An old friend of his, a sturdy young native named Mpomo, had been taken ill during his absence, and died the day after his return. Du Chaillu hastened at once to his house, to find his wives sitting weeping on the ground, throwing ashes and dust over their bodies, shaving their heads, and tearing their clothes. Their grief was evidently real, but the day after the funeral our hero's feelings of pity for the mourners were changed into indignation at the scenes which ensued.

The natives, unable to believe that any but the old could die from natural causes, sent for a great doctor from a distance to discover who had bewitched Mpomo, and caused his death. Two days of frantic excitement were succeeded by the assembly of all the inhabitants of the village in the market-place to witness the doctor's final incantations for disclosing the names of the sorcerers. Every man and boy was armed with spears, swords, guns, or axes, and on every face was written the lust for blood. In vain did Du Chaillu, who had hitherto generally been able to obtain a hearing, lift up his voice in favor of mercy ; permission to kill the witches had already been obtained from King Quengueza, and the white man's protests were only laughed at.


ENCOUNTER WITH A GORILLA.

Determined to see the end, no matter how awful that sight might be, Du Chaillu drew back amongst the gesticulating crowds, and, silence being with great difficulty enforced, he heard the doctor say: "There is a very black woman, who lives in a house" (here followed its description); "she bewitched Mpomo." The words had scarcely left his lips when the armed natives, leaping and yelling, rushed to the place indicated, and brought back a poor girl named Okandaga, sister of a guide who had faithfully served Du Chaillu. Bound with cords, and with spears waving above her head, she was swept down to the river side, catching sight, as she passed, of our hero looking on with horror-struck dismay. "Chally, Chally!" she cried, "do not let me die!" and for a moment the white man thus appealed to was tempted to rush in amongst her murderers and try to rescue her. But it would have been useless, and, turning away, he owns he shed bitter tears at his own helplessness.

Okandaga gone, the people waited in eager silence for the name of the next victim, and soon a harsh voice again rang out, shouting: "There is an old woman in a house; she also bewitched Mpomo." This time a niece of King Quengueza was seized, a fine, noble-looking creature, who met her accusers with quiet dignity, motioning to them to keep their hands off, and saying: "I will drink the mboundou, but woe to my accusers if I do not die." Then she too was taken down to the river, but unbound. A third time silence fell upon the multitude, and a third time the doctor's voice proclaimed the name of a sorceress, singling out a woman with six children, one of Quengueza's slaves.

DRINKING THE FATAL CUP.

The unhappy trio now awaited their doom upon the river bank, and the doctor having recited their crimes, calling upon the people to curse them, they were put into a canoe with the executioners, the doctor, and some others, all armed. The tom-toms or native drums were then beaten, and the mboundou was prepared. The cup was held by Quabi, Mpomo's eldest brother, and at sight of it Okandaga wept, and even Quengueza's niece grew pale. First the old slave woman, then the royal lady, and lastly Okandaga drank, the people shouting: "If they are witches, let the mboundou kill them; if they are innocent, let the mboundou go out." A few moments of expectant silence ensued, and then the slave fell down. Before life was extinct the executioners fell upon her, and hacked off her head. Next came Quengueza's niece, and lastly Okandaga, their blood dyeing the waters of the river for some distance. The awful tragedy was terminated by the cutting up of the bodies into small pieces and strewing them on the river.

In the evening the guide Adouma, brother of the hapless Okandaga, came to Du Chaillu, and poured out all his grief and horror. He had been obliged to take part in the awful scene, to curse his sister himself, or he would have had to share her fate, and now his heart misgave him. Our hero did his best to comfort him, telling him of the true God to whom Okandaga's spirit was gone, and the poor fellow said at last, "Oh, Chally! when you go back to your far country, let them send men to us poor people to teach us from that which you call God's mouth" (the Bible). The man was a savage in name, yet not in heart.

AN OFFER OF A FAT NATIVE FOR SUPPER.

A tramp across a swamp, a perilous climb along a rope bridge over the roaring Ovigni River, brought our hero into a rugged and mountainous country, covered with dense forests, haunted by gorillas, whose fearful roars, to which the explorer tells us he never became accustomed, alone broke the awful stillness. Beyond that again came a high tableland, forming the entry to the Alpine-like range running eastwards for a distance not yet determined from the Balakai country; and in December, as the party were passing through a dense wood, they suddenly arrived at the encampment of Remandjii, the king of the Apingi tribe, a fine-looking old negro, who immediately began to skip and jump in a very undignified manner, crying, "The spirit has come to see me! the spirit has come to see me!"

When his majesty's excitement subsided a little, Du Chaillu asked him to direct him to the next village, and, following the instructions obtained, with some difficulty he came to a magnificent stream called the Rembo Apingi, some three hundred and fifty yards wide. Rafts and canoes were at once put off from the opposite side, and he was triumphantly escorted by Apingi boatmen to their principal town, where a hut was immediately assigned to him. Here he was soon visited by Remandjii and the chiefs from the neighboring villages, who astonished him by presenting him with a slave, bound, ready for execution, with the words: "Be glad, O spirit! and eat of the things we give thee!" "Kill him for your evening meal," added Remandjii; "he is tender and fat, and you must be hungry." This was the fare offered.

Shaking his head and spitting on the ground to show his disgust, Du Chaillu made his host understand that he could not oblige him in this particular, and with some reluctance the white visitor's prejudices were humored. He was allowed to sup off fowls and plantains, Remandjii tasting everything first lest it should have been poisoned.

Du Chaillu describes the Apingi as a savage looking, yellowish-black race, with the usual woolly hair, broad nostrils, and thick lips, and much the same superstitions respecting death and witchcraft, as their neighbors of Ashira Land. After he had been amongst them but a few days, and had excited much wonder by his powers of writing, he was surprised at being urged by thirty of the great chiefs, with Remandjii at their head, to be their king. "Spirit, you are our king," said their spokesman. "You have come to our country to do us good. You can do everything. Now make us a pile of beads as high as the highest tree in the village, that we and our women and children may go and take as much as we wish." They ascribed to him supernatural powers.

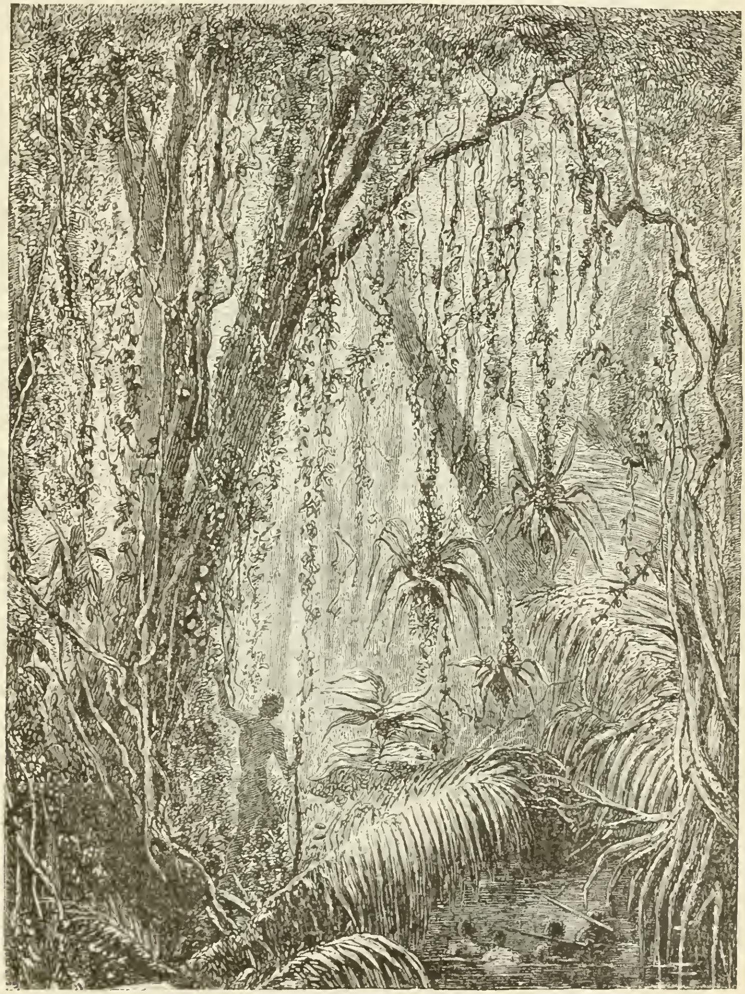
DU CHAILLU MADE KING.

His refusal to accomplish this impossible feat was considered unkind, but he could not convince them of his powerlessness, and was formally invested by Remandjii, in the presence of an immense crowd, with the insignia of royalty, and from that time till his return home he was treated with all, and more than all, the honor due to a native potentate. But not even this distinction could reconcile him to a further protracted exile. He made, it is true, another unsuccessful attempt to reach the Falls of Samba Nagoshi, but on the very eve of a trip into Ashango Land, an attack of fever so completely prostrated him, that he resolved, as soon as he could walk, to return to Europe.

Of the journey back to Remandjii's he retained but a faint remembrance, and, arrived there, he lost no time in explaining that he must resign his royal dignity, and go. "We are sorry," said his subjects; "but as it is the will of the spirit, we must submit. Wait, however, that we may get him food, that he may not be hungry by the way." Plantains and fowls were then brought to him; he was requested to keep his kondo, or insignia of royalty, that he might be master again when he came back, and bidding his simple friends farewell, he started for the coast, arriving in the Gaboon early in June.

On the publication of Du Chaillu's account of his experiences in this eventful journey, a perfect storm of accusation arose against him. His visit to Ashira Land and discovery of the Ngouyai River were spoken of as pure inventions, and his descriptions of the gorilla, and the nest-building ape, were laughed at as widely exaggerated. In 1862, however, a French Government expedition ascended the Ogobai for some distance, confirming in the main all their great predecessor's statements, converting his adverse critics into admiring friends, and encouraging him to undertake a new journey in 1863–65, in which he penetrated still further into the interior than before, and fixed with scientific accuracy the geographical position of places discovered in his former explorations. He tells us that he also cherished a secret hope, unfortunately not realized, of reaching in the far interior some unknown western tributary of the Nile, and to descend by it to the great river, and thence to the Mediterranean.

Following out his determination to add to his previous discoveries, on this new journey Du Chaillu arrived off the Camma coast in October, 1863, and two days later in the same month at the mouth of the Fernand Vaz. Two canoes were put off from shore as soon as his vessel was sighted, in one of which he recognized an old negro friend, who exclaimed on seeing him: "Are you Chally, or are you his spirit? Have you come from the dead? Tell me quick, for I don't know whether I am to believe my own eyes; perhaps I am getting a kende" (fool). Assured of Du Chaillu's identity, the warm-hearted native



REMARKABLE FOREST GROWTHS IN AFRICA.

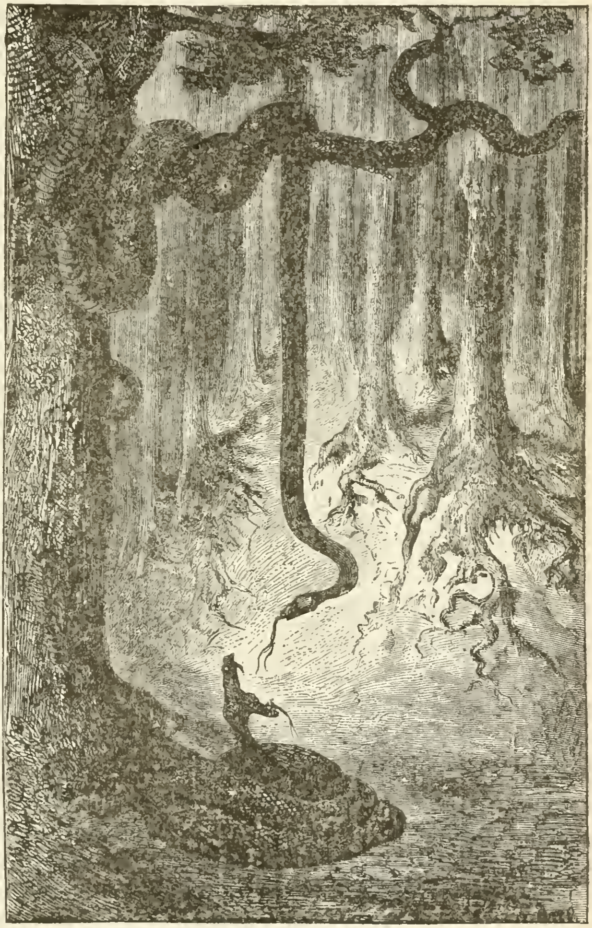
flung his arms round his neck and hugged him in a transport of joy; and as soon as this rather too warm greeting was over, came a nephew of our old acquaintance, Chief Ranpano, whose enthusiasm at the white man's return was equally great. After a somewhat perilous paddle from his vessel to the shore in one of the frail canoes, Du Chaillu landed amongst a crowd of gesticulating and yelling natives, frantic with joy at his return, and was escorted up the river to his old home of Washington, which he found in ruins, a few loose bamboos and rotting poles alone remaining.

Having determined to fix his new quarters about two miles above the site of Washington, our hero returned to the schooner to superintend the disembarkation of his outfit and goods, hoping almost immediately to begin his explorations. But, alas! the canoe in which he and the captain of the schooner embarked with all the valuable scientific instruments was upset, and though, thanks to the eager devotion of the natives, the two white men escaped with their lives, all the instruments which were recovered were rendered useless by the salt water. There was nothing to do but to wait until others could be obtained from England. In November a young male chimpanzee about three years old was brought to him by a negro, who had caught him. The little fellow, whom Du Chaillu christened Thomas, proved tractable though mischievous, and was sent to England. He lived for some years in the Crystal Palace, but perished in the great fire of 1867.

GORILLAS ON THE RUN.

On this journey Du Chaillu's main object in passing through Ashira Land was to visit the Falls of Samba Nagoshi, which he had already made two abortive attempts to reach, and well provided by Olenda with guides and porters, he started on this interesting excursion in December. Following a north-easterly direction, he quickly reached the Ovigni River, and crossing it with great difficulty by means of a single tree-trunk thrown carelessly over its foaming waters, he began a weary march along the western foot of the hilly range shutting in Ashira Land, through an almost impenetrable forest, to the Opangano prairie, a little beyond which he came to the first Bakalai village. Passing through its single street, with a gate at each end and houses with no doors in the outer walls, our hero passed on in a north-easterly direction till he came to the wild Lambengue prairie, succeeded by a dense forest, where, marching somewhat in advance of his party, he surprised a group of some ten gorillas in a single tree. With nothing in his hand but a walking-stick, and feeling discretion to be the better part of valor, our hero was about to beat a retreat, when his men coming up altered the aspect of affairs; the gorillas, who were hurrying down to the attack of a single enemy, uttered wild cries of fright, and disappeared in the thick jungle. The negroes rushed after them with their guns, but were unable even to bring down one, owing to the bad markmanship of the natives, and great agility on the part of the gorillas.

The first white man to visit the country between-Ashira Land and the mountains inhabited by different Aviia tribes, Du Chaillu's approach caused the immediate evacuation of every village, and only with great difficulty were the inhabitants coaxed back to their homes and induced to supply their visitors with food. Everywhere famine had been doing its ghastly work, and in one miserable hut our hero was shocked to see an old woman, a mere skeleton, left to die alone. She was infirm and useless; why should any of the small store of food left be given to her? urged the men to whom he expressed his horror.



A STRANGE COMBAT.

In December, finding the river no longer navigable, Du Chaillu started on foot for the falls with an Aviia guide, and after an exciting march through dense jungle, across small tributaries of the Ngouyai, some so deep as to involve swimming, he came at last in view of the object of his journey. The stream, he tells us, just above the falls is one hundred and fifty yards wide, but a rocky island in the middle, covered with trees, divides the water in two unequal parts, only one of which can be seen at a time. The right hand fall, some seventy yards wide, rushes down a steep incline in immense volume, but the left is comparatively insignificant. The right, on the whole, though grand and wild, was not in fact so impressive as our hero had expected, and he found the less important rapids lower down more beautiful. Still he had achieved the object of his journey.

A singular combat he witnessed in the depths of the forest between two huge boas, probably of different species. One lay coiled on the ground, the other had taken post on the branch of a tree. It ended by the former seizing the head of its opponent with its wide open jaws, sucking in a part of its huge body, gradually unwinding it from the tree. It had attempted, however, a dangerous operation. Suddenly down came the tail, throwing its coils round the victor, and the two monsters lay twisting and writhing in the most terrific manner, till both were dead.

A PLAGUE AMONG THE NATIVES.

Eager now to pursue his course eastwards, Du Chaillu lost not one moment in pressing forward his preparations, but before he was able to start a terrible calamity overtook Ashira Land, involving not only serious delay, but personal danger to the explorer. This was the breaking out of small-pox, a disease never before known among the natives. Elanga, one of Olenda's nephews, was the first to fall a victim, and being in Du Chaillu's service, suspicions of witchcraft having been exercised by the white man were at once aroused. A few days later, two other cases occurred, also amongst our hero's servants, and when he separated the survivors from those whom he thought infected, giving them strict orders to keep away from the places where the disease had broken out, public opinion ran high against him. He was boldly accused of having introduced the plague, of having brought death instead of the promised good to the people, of having killed Remandjii, who had died since his last visit to Apingi Land.

But for Quengueza's and Olenda's faithfulness, things might have gone badly with Du Chaillu, for a word from either of them would have fanned the smouldering fire into a flame, and another fearful execution would have taken place, with the once-beloved "spirit" as the central figure. Fortunately, Quengueza became very angry at the suspicions of "his white man," asking the people whether he, the king, who held the passage of the Rembo, had come with him into the bush amongst these pigs of Ashira to be cursed? This protest was seconded by Olenda, who held his royal guest in great respect, and sent round at his suggestion to the neighboring villages to try and collect porters and guides.

Du Chaillu, after many difficulties from the dishonesty of his Ashira porters, arrived in safety at Mayolo, an important village of Otando Land, early in April, but he had not long been there when the chief was taken ill. This was embarrassing, for, should he die, further progress would be impossible, as the negroes would certainly have driven away the man at whose coming their head men were thus stricken down. To add to the visitor's troubles, a conflagration of the prairie round the village took place immediately afterwards, but the fire was checked in time to save his goods, and Mayolo recovered, not, however, without suspicion of witchcraft again fallen on the "spirit." A grand palaver was held, in which Du Chaillu was put on his trial, and, thanks to the friendship of Mayolo, came off with glowing colors, the chief winding up a long oration by shouting, with repeated blows on his chest to give force to his words: "Here I am alive; they said I should die because the spirit had come, but here I am." This quieted suspicion.

FOES IN THE PATH.

At Dilolo, a very dubious reception was given to the travelers. The entrance to the village was barricaded and guarded by all the fighting men, armed with spears, bows, arrows, and sabres, who cursed the Oguizi carrying with him the plague into their country, and declining to give him permission to enter. Anxious to avoid an encounter, the travelers turned off into a path leading round the village, but they were met by a fresh body of natives, who drew their bows, ready to fire. The Cammi men, who from the first had behaved with admirable pluck, gathered round their master, and the lad Rapelina pointed his gun in the face of one sturdy fellow, telling him he would be a dead man if he let fly his arrow. This demonstration was immediately effective, the Ishogo warriors drew back, yelling and gesticulating, and the little caravan passed unmolested.

Similar difficulties occurred in the more easterly villages, and as the party penetrated further and further into the unexplored interior, the people became more suspicious and traveling more arduous. One range of mountains succeeded another, one village after another sent out its crowd of Aponos or Ishogos to stare at and interrogate the white man, but his guides remained faithful, and his own courage never failed. Ishogo Land, with its well-watered prairies and densely-wooded hills, its well-built towns and sturdy inhabitants, was traversed in safety, and the end of June found our hero entering Ashango Land, the most easterly province explored, where he made acquaintance with the curious dwarf tribe known as Obongos, living in low oval diminutive huts, and keeping themselves apart from all intercourse with their fellow-countrymen, the true Ashangos, a race differing in language, but in little else, from their neighbors the Ishogo.

An unfortunate accident alone prevented Du Chaillu from realizing his dream of returning home by way of Abyssinia and Egypt, and for the time being placed his expedition in jeopardy. He had penetrated as far as the east of Ashango Land, he had quelled a dangerous mutiny amongst his porters, he had overcome the reluctance of the natives to allow him to proceed, and persuaded them that he meant no harm to anyone, when his man Igala accidentally let off his gun and killed an Ashango. The effect was electric and instantaneous. The war drums began to beat, and the chief shouted indignantly, "You say you do not come here to do us harm, and do not kill people; is not this the dead body of a man?"

SUDDENLY ATTACKED BY A SHOWER OF ARROWS.

No more hope now of further progress, scarcely any of escape with life. Knowing that hundreds of natives armed with spears and poisoned arrows would be upon him in a few minutes, Du Chaillu called his men hastily together, loaded them with his most valuable possessions, and with the words, "Now, boys, keep together; do not be afraid; let us try our best, and we may reach the sea in safety," he prepared to sound the retreat should the worst come to the worst. For one moment there seemed to be a chance of peace. Igala had explained that the man had been killed by accident, and that his master would pay the value of twenty men in goods. The war drums ceased to beat. A headman cried, "A palaver, a palaver!" but before Du Chaillu had time to hope, a woman came rushing out of a hut declaring that her husband also had been killed by the fatal bullet, which, after passing through the head of the negro, had pierced the thin wall of her hut.

It was too true! A general shout of war was raised, and every warrior rushed for his weapon. The order was given for retreat, and away went the little band—first Igala, then his Cammi comrades, then Du Chaillu himself. Not a moment too soon! Showers of arrows were discharged even before they left the village. Makondai and Rebouka were all but transfixed by spears, Igala was hit in the leg, and Du Chaillu on the hand. But on, on they sped, their blood dyeing the path behind them, and closer and closer came the pursuers. One load after another was flung down, one man after another staggered as some well-aimed missile quivered in his flesh. A second arrow struck Du Chaillu in the side, causing exquisite agony, but at last a little stream near the village of Mobana was crossed, and the fugitives managed to elude the enemy by striking into a secluded forest path. One negro alone was left behind, but as his comrades were resting for a few moments and trying to stanch the blood from their wounds, he came up unhurt, with the good news that the natives had determined to follow no longer—so many of their men had fallen already, "they should all be killed one by one if they went on."

Cheered by this good news the fugitives pressed on, and after many a narrow escape they got back to Ishogo Land, where they were eagerly welcomed and entertained by friends made on the journey up. Mayolo could scarcely believe his ears when he heard of the flight without the loss of a single man from the poisoned arrows and spears of the dreaded Ashangos, and the remainder of our hero's progress to the coast was one long triumph. Avoiding Olenda, where he had suffered so terribly, he made his way across country to Goumbi, and thence to his own little settlement on the Fernand Vaz, arriving there in 1865. Here he took a most touching farewell of the faithful Cammi with whom he had seen and suffered so much, and six days later set sail for Europe, having considerably supplemented the geographical and ethnological discoveries of his previous journey by his researches in Ishogo and Ashango Land, escaping as many if not more perils than any other hero of African exploration, either north or south, in that dark country.

CAPTAINS BURTON AND SPEKE.

The cause of geographical research owes much to Baker, who pursued his travels in Africa with the energy of an enthusiast, and even more, perhaps, to Burton, Speke and Grant, all of whom have made rich contributions to our knowledge of the tropics, and have rendered themselves famous by their successful explorations. Burton and Speke were companion discoverers, and, for a time, fellow travelers.

The end of May, 1857, found all ready for their great expedition to the west, and early in June they left Zanzibar to land on the opposite coast at Kaole. The party consisted of Burton and Speke, the Sheikh Said, who acted as leader of the caravan; two half-caste boys from Goa, a couple of negro gun carriers, and eight men as general helpers and protectors, all of whom would be needed in the journey.

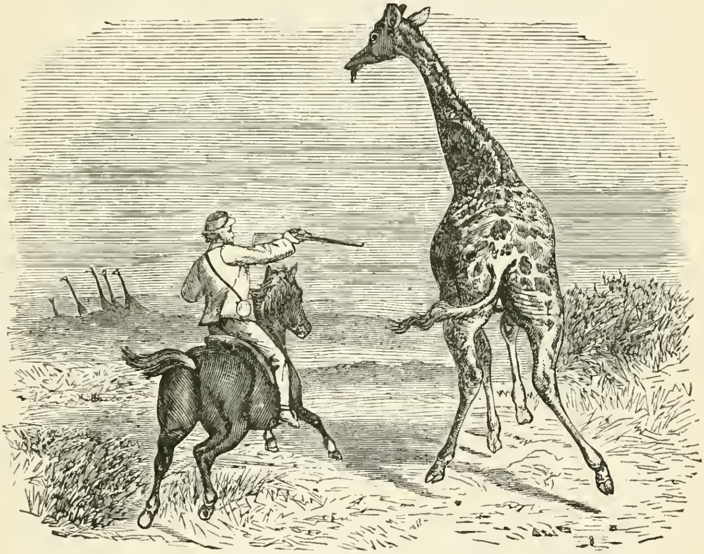
Towards the close of August the east coast range of mountains was approached, and the spirits of the explorers rose, only to sink again as they passed the skeletons of native porters, who had fallen here and there upon the road in former expeditions. Some of their own men from Zungomero died, but they themselves escaped, though Burton's sufferings were very great. In the actual transit of the mountains several men struck for food, as they were disappointed at the goats being spared for future contingencies when they were hungry, a difficulty which Speke settled by ordering a march, and going on without the malcontents, who had relied on his finding them indispensable. Not approving of being left behind to shift for themselves, they sulkily followed the caravan, and on their voluntarily aiding Burton, who fell down by the wayside in a paroxysm of fever, they were forgiven, and allowed to march on with their comrades. This incident produced a good result, and pressing on with fresh courage, in spite of Burton's terrible condition of health, they came to a village in the mountains, where they hoped to obtain provisions and help. But alas! on entering it they found it deserted, and the huts burned down. It had evidently quite recently been the scene of an outrage by slave-traders, but our heroes' men were so little touched by what they saw that they spent the night in singing, dancing, and ransacking the ruins.

At Rumuma, a well-known resting-place for caravans, plenty of provisions were obtained. Before ascending the so-called Windy Pass, a long halt was made in a cheerful ravine. When they were about half-way up, and the animals were stumbling at every step, scarcely able to proceed, the native war-cry suddenly rang out, and from every hill-top near poured down archers and spearmen on their way to the villages below. The presence of the white man's caravan had protected the inhabitants for a time, but now it was leaving, and a foraging raid was at once sent down, yet no attempt was made to stop the explorers, nor to inflict upon them any bodily injury.

A WHOLESALE ROBBERY.

Cheered by the hope of crossing the intervening plateau of Ugogo and reaching Kazeh, the great emporium of Arab traffic in the lake regions, without much further difficulty, Burton and Speke pressed on, but their troubles were not yet over. The mountains, it is true, were left behind, and there were no more war parties to be encountered, but at every village the unfortunate travelers were delayed to be plundered by chief and people, force being used if the exorbitant tribute demanded was not readily paid. This state of things reached its climax at a place called N'yika, or the wilderness, the home of the most powerful chief of the Ugogo, who kept our heroes prisoners for five days, but finally let them go on payment of a smaller sum than that originally demanded.

Beyond Ugogo, the last and most interesting stage of this important journey began, for the now famous Land of the Moon was entered, the Garden of Central Intertropical Africa, consisting of a hilly table-land, including in its breadth one hundred and fifty-five geographical miles. Bounded on the north by the Nyanza Lake, afterwards discovered by Speke, and on the west by Lake Tanganyika, it has now been traversed from end to end by modern explorers, and the origin of its name and its former history have alike been eagerly studied and discussed. It is enough for us to state that there is evidence of its having once existed as a great empire, and that its general character is rolling ground, intersected with low and conical hills, whose lines ramify in every direction. The reclaimed tracts and clearings are divided from one another by strips of primeval jungle varying from two to twelve miles in length, and, as in so many parts of East Africa, the country is dotted with fairy mounts, dwarf mounds, the ancient sites of trees now crumbled to dust, and the debris of insect architecture. Villages rise at intervals above their impervious walls of milk-bush, with its coral-shaped arms, and in rich pasture-lands graze extensive herds of plump high-humped cattle. Lions, leopards, and wild cats still haunt the forests; the giraffe, the rhinoceros, the Cape buffalo, the zebra, and the koodoo roam the plains; and hippopotami and crocodiles abound in every large pool.



HUNTER PURSUING A GIRAFFE.

The giraffe is one of the curiosities of the animal kingdom. In nearly every part of Africa it is found, is wild in its natural state, yet easily becomes domesticated, and in captivity is extremely gentle, becoming strongly attached to those who treat it with kindness. It sometimes grows to such a height that its head is sixteen or seventeen feet from the ground. Formerly it was supposed that its fore-legs were longer than those behind, but actual measurement shows them to be an inch shorter. Its eyes are very beautiful, large, and brilliant, and its skin is finely marked with dark brown spots surrounded by a narrow white strip. It feeds upon grass and the leaves and tender branches of trees, and when startled by the hunter darts away with a speed nearly equal to that of the swiftest horse.

The two chief races inhabiting this favored district are the Wakimbu and the Wanyamwezi, the former an immigrant tribe from the south, the latter the original proprietors of the soil, and a typical race of this part of Africa, its industry and commercial activity having given it a superiority over kindred tribes. Tall and stout, with a dark sepia complexion and crisp curly hair, but with features less strongly marked than is usual with negroes, the Wanyamwezi distinguish themselves from other clans by removing the eyelashes, enlarging the lobe of the ear, and branding a double line of little cuts from the eyes to the middle of tne cheek. Sometimes a third line or band of three small lines is drawn from the forehead to the bridge of the nose. The women extract the lower central teeth, and the men chip away the inner corners of the front upper incisors. The long tobe or loose mantle is the favorite garment of both sexes, and beads and copper ornaments are worn in profusion.

AN ECCENTRIC QUEEN.

Leaving Unyanyembe in July, Speke crossed a broad valley with a gentle declination, full of tall and slender forest trees, and lined on either side by low hills, and entered the Unyambewa district, ruled over by a sultana named Ungugu, on whom every traveler was obliged to call, but who, as usual with African potentates, detained our hero several days before she granted him an interview. A messenger came to fetch the white man to the royal abode, and he was conducted to a palisaded house set down in a wave-like valley, one of many undulations characteristic of Unyambewa. Arrived in a yard full of cows, serving as an ante-room, a number of negroes welcomed him with a salute of drumbeating, and in ten minutes a body of slaves came rushing in and hastily desired him to follow them.

Obeying orders, as in duty bound, Speke and his servants were led down one passage and up another into the centre of the sultana's establishment, a small court full of mushroom huts. Seated on a wooden stool set upon an outspread ox-hide, and with his suite squatting round him on the floor, the white man now awaited the arrival of his hostess, who, however, sent her "lady's-maid" first, just to make sure of the harmlessness of the visitor. Being very hungry, Speke's first request was for food, and this the "lady's-maid," an ugly, dirty, but kindly negress, at once supplied. Then, having watched the eggs and milk provided disappear with extraordinary rapidity, and convinced that the white man would not hurt her mistress, the maid disappeared, to return almost immediately and usher in her mistress.

The sultana was a stumpy old dame, with a short, squat, flabby nose, and an everlasting smile, dressed in a dirty Arab costume, with a profusion of brass, horn, and ivory ornaments. Squatting by Speke's side, she first shook hands, and then felt her visitor's boots, trousers, coat, and waistcoat all over. What a beautiful coat he wore, to be sure—could he not give it to her? No. What nice soft fingers and hands he had—they were like a child's, and what hair—like a lion's mane. Where was this wonderful hero going? "To the lake, to barter his cloth for large hippopotami teeth," answered a dozen voices; and, satisfied with this reply, her highness took her leave, followed by Speke's slave laden with the inevitable present, and charged to obtain permission for his master to depart.

Of course the present was voted poor, and not what the sultana would have expected from so distinguished a guest. She herself would give him a bullock, but that bullock was out grazing, it could not at once be caught; Speke must wait. The old story told in so many different ways on every journey in Africa—the explorer must never be in a hurry. Only after much persuasion would the sultana allow our hero to proceed without the bullock, which he did not want, and when he at last got away, he had to leave three porters behind him to drive the animal after him.

THE LONG-SOUGHT SOURCE OF THE NILE.

Speke at last discovered a sheet of water on the left, which ultimately turned out to be a creek, and the most southern point of the Nyanza. Crossing a grassy and jungly depression, he arrived at a deep, dirty watercourse, the fording of which delayed him several hours, and following its right bank the whole of the next day, he came to another and yet another jungle, ever, as he knew, close to the lake, but still unable to see it, until at last he ascended a long but gradually inclined hill, from the summit of which the vast expanse of the pale blue waters of the Nyanza burst suddenly upon his gaze. Thus took place the discovery of the second of the great Central African lakes, and, convinced that he had found the true and long-sought source of the Nile, Speke at once conceived the idea of undertaking a new expedition which should place the fact beyond a doubt. In this he was accompanied by Grant, his old friend and brother sportsman in India.

FATTENING WIVES.

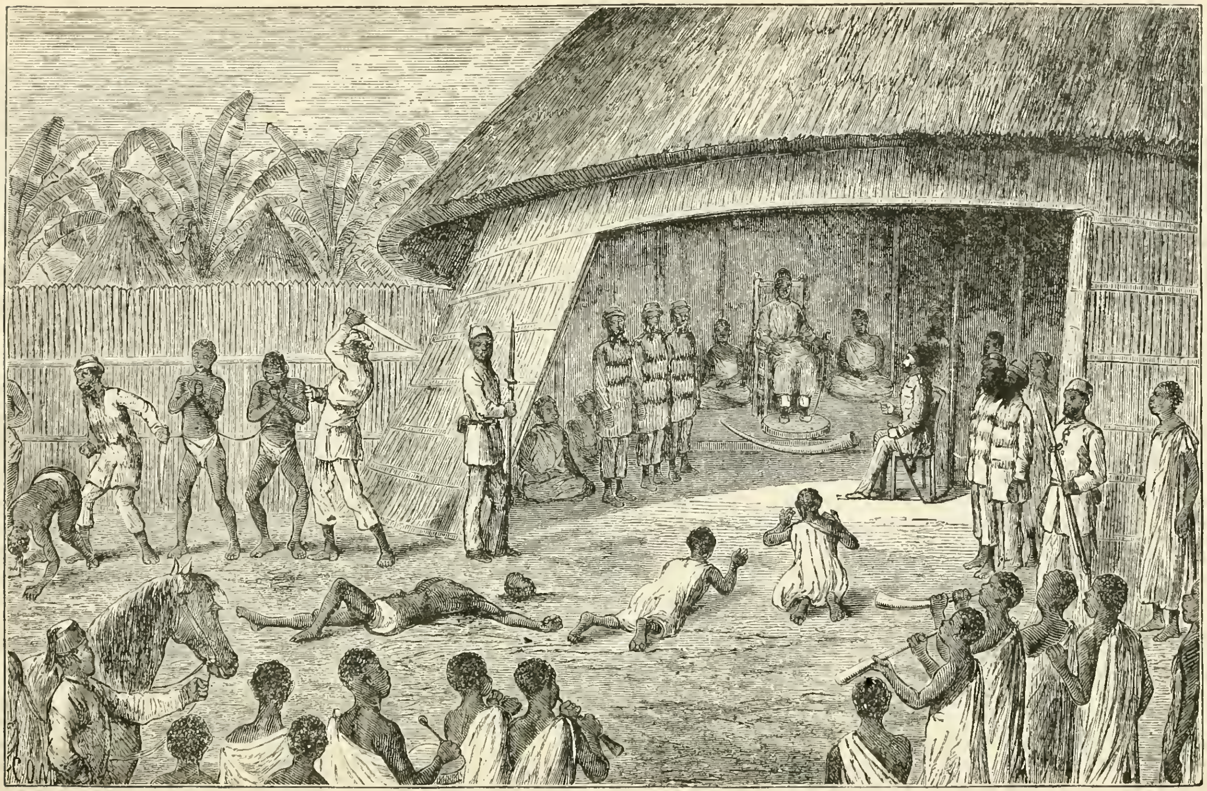
Speke remained in Karagwe for a month, but Grant was detained there by serious illness until the spring of 1862, when he rejoined his comrade in Uganda. During their stay with the celebrated chief Rumanika, neither of the explorers saw cause to change the first opinion they had formed of that chieftain's personal character, but more intimate intercourse with him showed that he held many strange and superstitious beliefs, and indulged in practices the reverse of civilized. One of the latter, which appears to have struck Speke most unpleasantly, was the fattening of the women of the court to such an extent that they could not stand upright.

Scarcely able to credit the reports he heard of this peculiarity in the royal females, the English leader obtained an interview with the king's eldest brother and his wife. On entering the hut, he found the old man and his chief wife sitting side by side on a bench of earth strewed over with grass, and partitioned like stalls for sleeping apartments. The wife could not rise, and so large were her arms that between the joints the flesh hung down like large loose-stuffed puddings. This result the husband triumphantly informed his guests had been obtained by milk, and milk alone. "From early youth upwards," he said, pointing to rows of milk bowls on the ground, "we keep these pots to our women's mouths." Wife-fattening is also practiced in the north-west of Africa, where obesity is considered the chief beauty in a woman. Another revolting custom in Karagwe was the mode of burial of members of the royal family. Speke relates that the body of Rumanika's predecessor, after floating about in a boat on the lake until decomposition set in, had been shut up in a hut with five living maidens and fifty cows, so inclosed that the whole of them subsequently died of starvation.

A VISIT TO THE GREATEST OF AFRICAN KINGS.

Early in January, 1862, messengers arrived from Mtesa, king of Uganda, inviting Speke and Grant to visit him, and reluctantly leaving the latter under the charge of Rumanika, the former started with a party of Arab traders. Speke entered Uganda in February, and came in sight of the king's kibuga or palace, which he described as a magnificent sight—a whole hill being covered with gigantic huts, such as he had never seen in Africa before. Eager at once to open relations with the owner of this handsome residence, our hero was advancing towards it, when he was stopped by some officers of the court, who told him that to enter unannounced would be considered indecent in Uganda; the men must be drawn up, the guns must be fired to let the king know of the arrival, then a house would be assigned to the visitor, and to-morrow he would be sent for.

Disappointed at this check, Speke ordered his men to fire, and was then shown some miserable huts for the accommodation of himself and his suite. Indignant at what he thought the disrespect of this welcome, Speke declared that the palace was the place for him, and if he could not go there at once he would return without seeing the king; but a native who had acted as messenger to Mtesa, persuaded him to have patience, or the consequences might be terrible—no stranger was ever allowed to enter the palace; the white man must conform to the customs of the country.



SACRIFICE OF VICTIMS IN HONOR OF VISIT TO KING MTESA.

Giving way to the man's appeal, which was evidently well meant, Speke entered the hut assigned to him, and was almost immediately molified by a message brought by the king's pages that a levée would be held in his honor the next day, which levée, the first of many since witnessed in the Palace of Uganda by white men, duly came off. Dressed in his best, in which, however, he tells us he fears he cut but a sorry figure, Speke, accompanied by his traveling escort, decked out in gorgeous array, started for the palace in high spirits, the courtiers lining the way shouting as he passed, "Irungi! Irungi!" (beautiful! beautiful!). The Union Jack, carried by a guide, led the way, followed by twelve men as a guard of honor, dressed in red flannel cloaks, and carrying their arms sloped with fixed bayonets, whilst in their rear were the rest of our hero's men, each carrying some article as a present. Winding up the sides of the hill, the procession entered the palace, and passing first the inclosure, in which the lesser female celebrities of the court reside, Speke was met beyond it by the high officers of the king, who stepped forth and greeted him with courteous dignity. Men, women, bulls, dogs, and goats, were being led about by strings; cocks and hens were carried in men's arms; and little pages, with rope turbans, rushed about conveying messages, as if their lives depended on their swiftness, every one holding his skin-cloak tightly round him, lest his naked legs might by accident be shown, for it was against Uganda etiquette that anything should be uncovered in or near the royal presence. In fact, but for Speke's interference, all his presents would have been wrapped in chintz, even to inanimate objects!

SPEKE STANDS ON HIS DIGNITY.

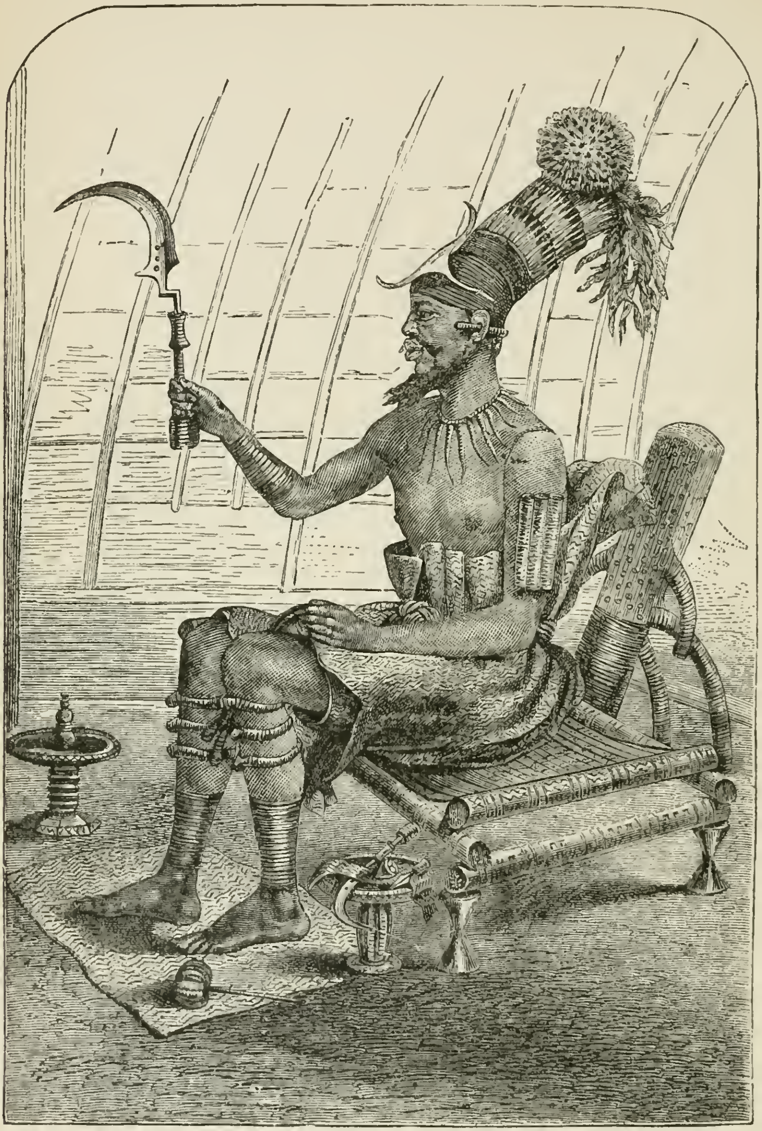
In the ante-reception court our hero was requested by the chief officers in waiting to sit on the ground in the sun with his servants, but he had determined beforehand neither to do that nor to make any obeisance but such as is customary in England. An English gentleman, he determined on being treated as such, and the event proved him to have been wise, for this rather vigorous standing up for his dignity gave the natives an impression of reserved power. Surely, they thought, this white man must be possessed of resources of which we know nothing, or he would never thus brave our master in his very stronghold.

On the reiterated but hesitating request of the officers that he would be seated, Speke declared that he gave them five minutes' grace, and if a proper reception were not then recorded him, he would walk away without seeing the king. There was a hut close by; why should he not enter and wait there? The five minutes passed in anxious suspense. Speke's servants trembled for his fate and their own. The officers looked at each other in despair. Finally our hero turned on his heel, ordered a porter to leave the present he held on the ground and follow him, and walked straight away home. Intelligence of the white man's behavior at once reached the king, who seems at first to have thought of leaving his toilet-room, where he was donning all his finery, and run after his guest himself, but his second impulse was to send messengers entreating him to return; he would not himself taste food until his guest was with him. All in vain; Speke merely shook his head; and at last came an humble message that if he would only return he might bring his own chair with him, and sit upon that, though an artificial seat was exclusively the attribute of the king.

GAY FESTIVITIES AT THE PALACE.

The point was gained, and having refreshed himself with coffee and a pipe, our hero returned to the palace, bearing his iron chair with him. The officers were now all obsequious ceremony; would their visitor sit down—would he hear some music? A band of performers, wearing long-haired goat-skins down their backs, then passed before him, dancing as they went along like bears in a fair, and playing on reed instruments worked over with beads in various patterns; drums were vigorously beaten by other attendants; and these preliminaries over, the white man was ushered into the presence of his majesty, who turned out to be a good-looking young man of about five-and-twenty, wearing a loose flowing garment fastened on the shoulder, and a quantity of really pretty ornaments made of beads, brass, and copper. His hair was cut short, except at the top, where it was combed up into a high ridge. Staff-officers on one side, a group of female sorcerers on the other, and numerous wives behind him, made up the court, who were one and all squatting on the ground in tailor fashion.

A little chat about the object of the white men in coming to these parts closed the first interview, and those which succeeded it were but repetitions of the same kind of thing. A few days after his arrival, however, Speke was admitted to an interview with the queen-mother in which he was entertained with music, and allowed to remain seated. Her majesty, fat, fair, and forty-five, greatly amused her guest by running away several times to change her clothes, with a view to impressing him with her wealth and importance. All the vagaries of the court were, in short, very amusing; and Speke, feted everywhere, had nothing to desire except permission to send an escort for Grant, and with him proceed on his journey. But here, as everywhere else in Africa, the king would fain have kept his white man with him forever. As in Karagwe, further acquaintance with the natives revealed many terrible practices, the worst of which was perhaps the daily offering of a human sacrifice for the good of the state, though Speke seems to have been more impressed by the occasional sudden execution of one or another of the king's wives for some trifling offense. The belief in magic, and many absurd superstitions connected with that belief, also prevailed throughout Uganda, but neither king nor people


THE GREAT KING MUNZA.

were as bigoted as either the coast or southern tribes of Africa. Mtesa knew of the navigation of the Nile by white men; he had heard of Gondokoro, and was anxious to open relations with its merchants.

The explorers have given some account of the powerful tribe called the Akkas, who have been conquered by King Munza, of the Monbuttoo tribe, and are now his subjects. This African monarch is second in power and wealth only to Mtesa, of Uganda, but is grossly addicted to cannibalism. A distinguished traveler, who recently visited his country, and was received with royal honors by the king on his throne, says: I was intensely interested in gazing at the strange, weird-looking sovereign, of whom it was commonly reported that his daily food was human flesh. With arms and legs, neck and breast, all bedizened with copper rings, chains, and other strange devices, and with a great copper crescent at the top of his head, the potentate gleamed with a shimmer that was to our ideas unworthy of royalty, but savored far too much of the magazines of civic opulence, reminding one almost unavoidably of a well-kept kitchen! His appearance, however, was decidedly marked with his nationality, for every adornment that he had about him belonged exclusively to Central Africa, as none but the fabrications of his native land are deemed worthy of adorning the person of a king of the Monbuttoo.

Agreeably to the national fashion, a plumed hat rested on the top of his chignon, and soared a foot and a half above his head; this hat was a narrow cylinder of closely-plaited reeds; it was ornamented with three layers of red parrots' feathers, and crowned with a plume of the same; there was no brim, but the copper crescent projected from the front like the vizor of a Norman helmet. The muscles of Munza's ears were pierced, and copper bars as thick as the finger inserted in the cavities. The entire body was smeared with the native unguent of powdered cam-wood, which converted the original bright brown tint of his skin into the color that is so conspicuous in ancient Pompeian halls. His single garment consisted of a large piece of fig-bark impregnated with the same dye that served as his cosmetic, and this, falling in graceful folds about his body, formed breeches and waistcoat all in one. Around the king's neck hung a copper ornament made in little points which radiated like beams over his chest; on his bare arms were strange-looking pendants which in shape could only be compared to drumsticks with rings at the end. Halfway up the lower part of the arms and just below the knee were three bright, horny-looking circlets cut out of hippopotamus-hide, likewise tipped with copper. As a symbol of his dignity, Munza wielded in his right hand the sickle-shaped Monbuttoo scimitar, in this case only an ornamental weapon.

CHAPTER VI.

NORTH AND SOUTH AFRICA.

The Pyramids, One of the "Seven Wonders of the World"—Their Use—Ascending the Pyramids—Egyptian Mummies—Ruins of Thebes—Mamelukes—Diamond Fields—Kimberly Mine—Mode of Operations—"Claims"—A Fight with Baboons—Ostrich Farming—The Hunter's Paradise—Dangers of Elephant and Buffalo Hunting—Adventures of the Chase.

THE ancients were in the habit of speaking of the "seven wonders of the world," one of which was the pyramids of Egypt. There are three principal pyramids, three that we hear most about, but there are nine, which form part of the vast necropolis or graveyard of Memphis, stretching out for miles along the sandy desert.

At a distance the pyramids are not impressive. It is after you have climbed the long sand-slope leading to the rocky platform on which they stand, and find yourself a mere pigmy looking up at the vast array of colossal steps of the Pyramid of Khufu, commonly called Cheops, the perpendicular height of which is four hundred and eighty feet, that you really feel overwhelmed. And when you call to mind that six decades of centuries have elasped since its builders were in the flesh like ourselves, and think of the enormous amount of money and labor which it cost to erect this vast pile, your astonishment increases still more.

Herodotus tells us that the onions, garlic, and ruphanus roots consumed by the workmen cost one thousand and six hundred talents, or one million dollars. But it is not so much the money spent on the pyramids as the wonderful scientific knowledge and skill required to build them that gives cause for surprise. There have been a great many theories as to their use, but there can be little doubt that they are simply royal sepulchres, and when you reach the summit of the great Pyramid you can see quite clearly that the king lay buried among his family and his nobles, his colossal funereal edifice towering over the many smaller tombs which are placed round him in a square, the little pyramids being those of the princes of his house.

But quiet thought is impossible until one has been some time on the ground, for the Arabs are clamorous to assist in the ascent, and though an active climber can do without them, you cannot send them away.

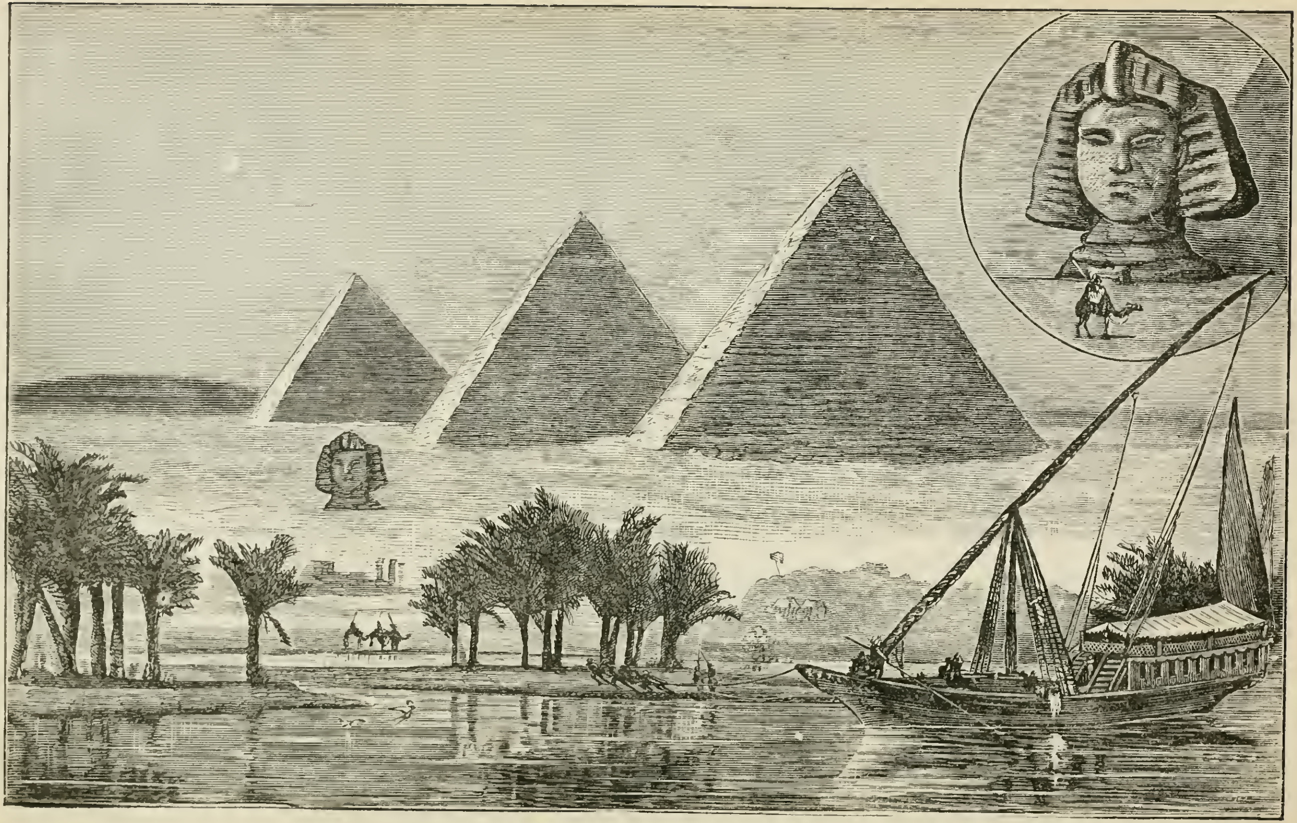
It is most amusing to watch them helping a lady, and as they do the business much better than those who are unaccustomed to it, the best plan is to let them have their way. The steps are generally about two feet in height, and some of them as much as three or four, so two Arabs take hold of the lady's hands, and a third follows behind to give her a friendly lift when needed. The affair takes about twenty minutes, if she does not stop too often. The Arabs say that ladies always go to the top, but they find gentlemen are by no means so fond of doing so. The whole exterior surface of the pyramids was originally polished, and also—as is believed—covered with inscriptions, but the blocks forming this surface were taken away by the Khalifs as material for other buildings, and it is their removal which has left the series of steps by means of which one now climbs to the top.

INTERIOR OF THE OLD PYRAMIDS.

An Arabian writer of the thirteenth century, tells us how "people without sense" destroyed ancient monuments in their search for concealed wealth, and adds that when treasure was no longer expected, the stones were carried away to be used as building material. In the clear atmosphere of Egypt you can see an immense distance from the summit of Cephren, and the view is full of interest. The desert lies at your feet, stretching away to the south and west, a billowy waste of sand dotted at intervals with other pyramids; and not far off Cairo, with its creamy domes and minarets, backed by a belt of palms, makes a lovely picture.

The entrance to the Pyramid of Cheops was formerly quite concealed, only the priests knowing where to find the movable stone that would admit them; now, however, we go in by an opening made in the north side, about forty-five feet from the ground, covered with a pent-house roof, and then descend by a narrow passage some three hundred and twenty feet in length, which probably led straight to the sepulchral chamber, but is now cut off by the falling of a granite block, so that one has to turn aside and scramble up one passage and down another, now leaping across a chasm, now climbing with the help of a ladder, if one wishes to visit all these strange chambers, which look like a fit prison for fallen angels. There is, however, only one thing to be seen, the great red granite sarcophagus now emptied and broken; but the effect of the vast cavern-like place, partially revealed by torches, or perhaps wholly so for a moment by magnesium light, is very striking.

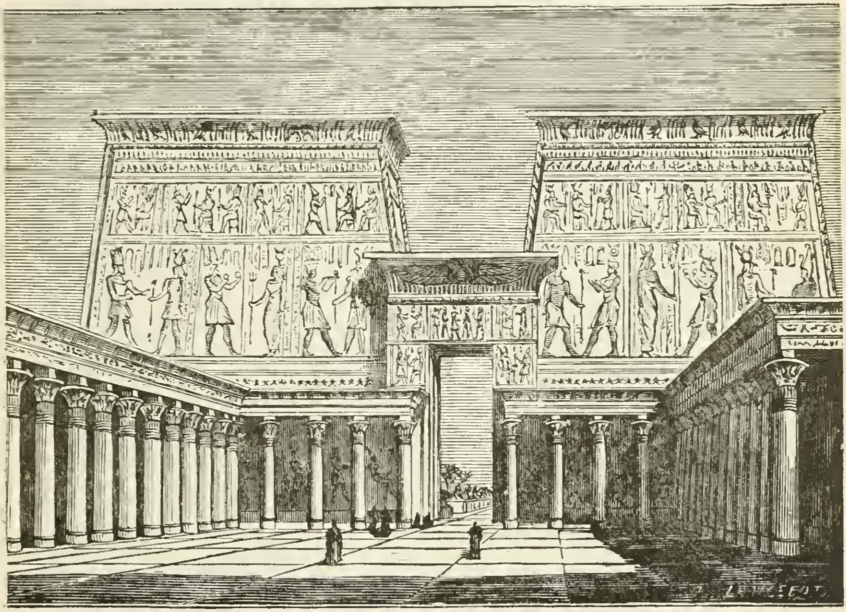
On coming out of the pyramid the great Sphinx stands before the visitor. The body is one hundred and forty feet long, and its head is thirty feet in height. It has an altar between its paws to which you ascend by a long flight of steps. It is now, however, so mutilated and



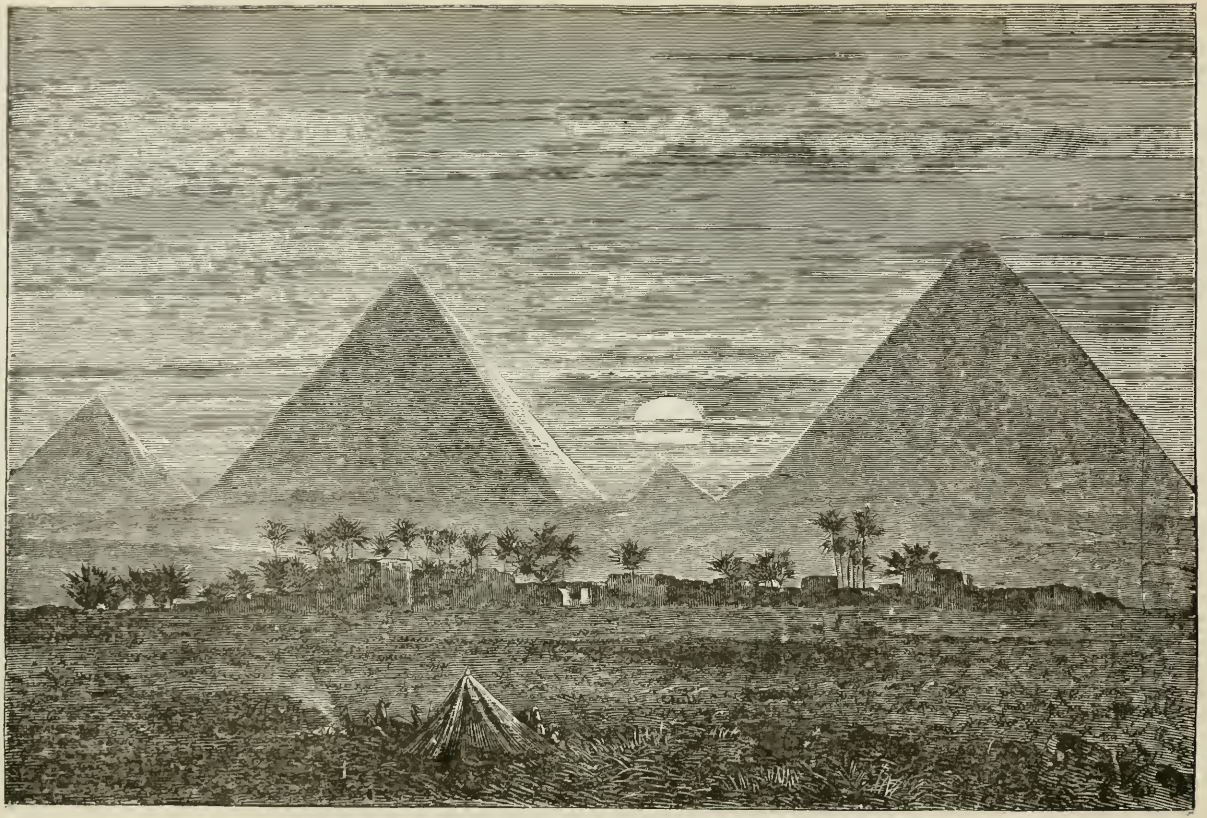
ASCENDING THE NILE—NEAR THE PYRAMIDS.

covered by sand that it is difficult to form any idea of its real grandeur. The Arabs call it "the father of terror."

Of the many wondrous discoveries made by Belzoni, none was more noteworthy than that of the entrance to Cephren, the second of the mighty pyramids of Ghiza. Seated during his travels at the foot of this second pyramid, Belzoni mused as to the probability of there being an entrance to its interior, arguing that it was highly improbable that such a magnificent structure should have been reared without containing chambers and a means of entrance thereto. He knew that the first pyramid had been explored, but every historical account, from those of Herodotus downward, joined in declaring the second pyramid to be one huge monumental blank. But Belzoni, carefully examining the exterior, at length came to the conclusion that there must be a way to the interior, and set himself boldly to the discovery. The first step to be taken was to obtain permission from the Bey, and that accorded, he collected sixty workmen, and set them to break with their hatchets through a heap of débris joined together by the pulverized mortar that had fallen from far up the side of the pyramid, and then been moistened by the heavy night dews.

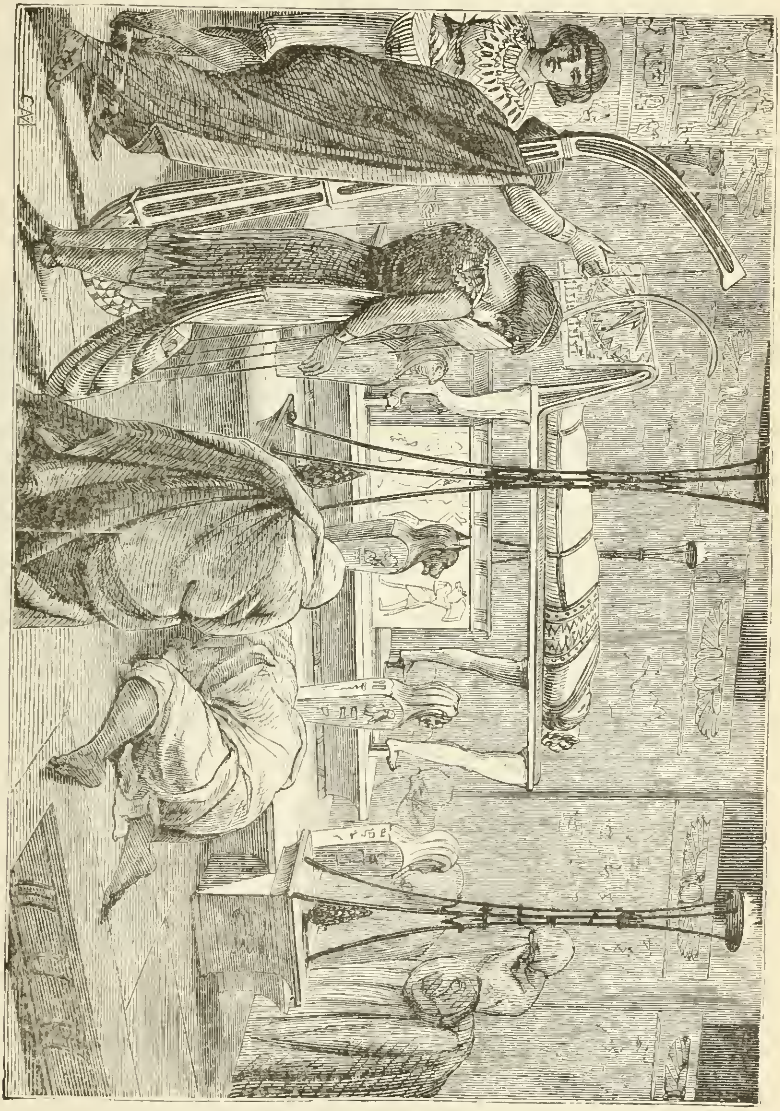

ANCIENT EGYPTIAN TEMPLE.

A long period of toil then followed, ending in the discovery of a cavity in the side, but no means of entrance. Disappointed but not



GENERAL VIEW OF THE GREAT PYRAMIDS OF EGYPT.

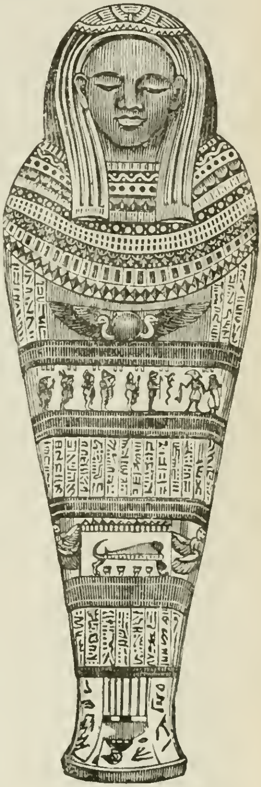
daunted, Belzoni again surveyed the vast sides of the building, and determined to try in another spot, where, after the labor of many days, first one and then another block of granite was uncovered, and at last the entrance to the pyramid reached—a low passage choked up with fallen stones, which required arduous toil to draw them out. But in spite of the opposition and idleness of his Arab laborers, Belzoni per-



EMBALMING THE BODY OF AN EGYPTIAN KING.

severed, till a passage large enough to admit one of the men was cleared, and soon after, armed with a torch, the traveler stepped in, and began to look for the reward of his thirty days of incessant labor.

His light burned dimly in the gloomy echoing passage leading to the vast solitudes that had not been invaded for more than two thousand years, and it was with a strange feeling of awe that this enterprising man passed on, breathing the dust of a vast antiquity, and with lifted torch trying to pierce the gloom. Passage after passage he explored through the huge rock-built structure; peering anxiously forward lest he should be plunged unawares into some deep pit yawning to engulf him; but he passed on in safety till he reached a door, evidently leading into some great chamber, and then, stepping boldly forward, he stood in the centre of the huge building, trying to pierce the darkness around, and gazing wonderingly at this mausoleum of an antiquity so great that human history gives but a poor clue to its age.

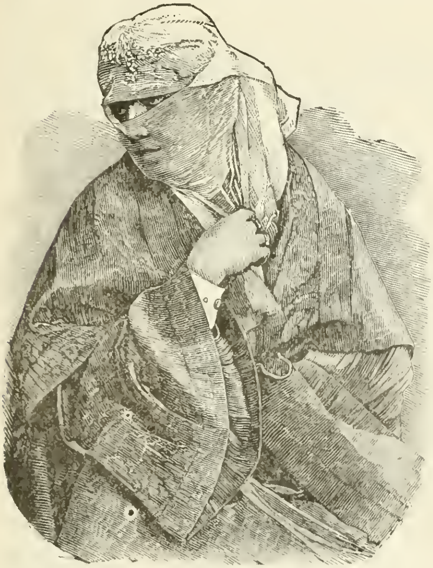


A MUMMY CASE.

The contents proved to be a large sarcophagus of granite; but far from satisfied with this result of his research, Belzoni sought on, and explored passage after passage, and echoing gloomy chambers, evidently formed to be the last resting places of the kings of some ancient dynasty; but the grandeur of this solemn temple of the dead seemed to lie in its vast solidity and massiveness of construction, qualities which have been the admiration of travelers of every country.

The preservation of dead bodies in an uncorrupted state was one of the principal arts of ancient nations, while with some it was also a sacred duty. Prescott says that the Peruvians were in the habit of placing the bodies of their dead upon the high levels of the Andes, where the continuousness of the draught of pure air acted as an antiseptic, and prevented natural decay. In deserts, corpses have been found, presumably hundreds of years old, preserved by the action of sand and wind; and it is known that in the Arctic regions the intense cold of the atmosphere acts as a preservative against corruption; but in both cases equally, the preserved bodies have been the result of accident rather than design.

The Egyptians were of all people the most particular about insisting on the preservation of their dead bodies, and the most skillful in carrying it out. They used to keep the bodies of their ancestors embalmed, in little houses, beautifully adorned, and took great pleasure in beholding them, as it were alive, without change, and with "no hint of death in all their frame." Testimony to their skill in embalming is borne by the mummies that remain even to this day, many of them being upward of two thousand years old. They used several processes for embalming. After injecting medicaments, which consisted of myrrh, cassia, and other spices, and soaking the body in nitre seventy days, it was wrapped in swathes of fine linen and gums, and these were covered again, according to fancy, with robes and tissues, or were simply placed, as it were, in bed in the dead-room.

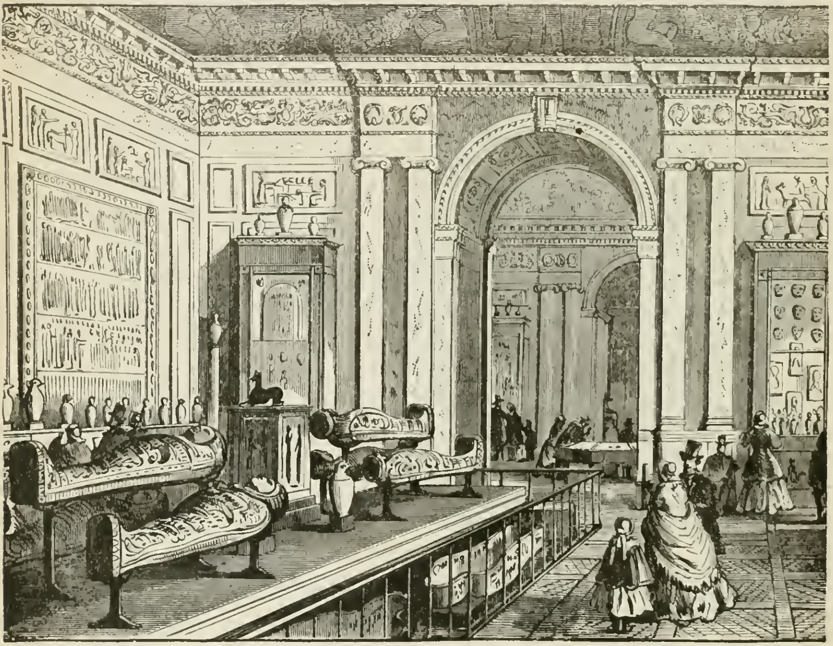


A VEILED BEAUTY—EGYPTIAN CUSTOM.

Another process, used for inexpensive embalming, was to inject a liquor extracted from the cedar-tree, into the body of the dead, which caused the corrupting elements to come away with the liquor. The body was then wrapped in a winding sheet containing a quantity of salt of nitre, and so was preserved for a time; but this process, as it was not so costly, was not so durable as the other. The modern process of embalming is different from both of these, and though very successful cases of preservation have been effected by it, it is to Egypt that must be ascribed the greatest excellence in the mummy-making art.

In the Etruscan Vase Room at the British Museum is to be seen the skeleton of one Pharaoh Mykerinus, decently encased in its original burial-clothes, and surrounded by fragments of the coffin, whereon the name of its occupant can be easily read by Egyptologists, affording conclusive evidence that it once contained the mummy of a king who was reigning in Egypt more than a century before the time of Abraham. Astronomical evidence enables us to determine the time of two important epochs in the history of Egypt, one of which is connected with this mummy. Sir John Herschel has fixed the age of the Great Pyramid of Ghizeh to the middle of the twenty-second century B.C. The tablet of Abydos shows that the Pharaoh whose bones still exist succeeded the builder of the Great Pyramid with only two intervening kings. We are therefore warranted in assuming that the remains of Pharaoh Mykerinus belong to the age to which they have been assigned. They are the dusty relics which remind us of a period far remote in antiquity.

One of the most wonderful sights this country contains are the ruins of the city of Thebes, in upper Egypt, "the city of a hundred gates," the admiration and theme of ancient poets and historians. This venerable city, the date of whose destruction is older than the foundation of other cities, and the extent of whose ruins, and colossal fragments, still offers so many astonishing objects, is so full of interest, that one is riveted to the spot, unable to decide whither to direct the step or fix the attention. For eight miles on either bank of the Nile do these ruins extend, retreating inland until enclosed by mountains, and describing a circuit of twenty-seven miles. Perhaps the most remarkable of these ruins are those of Carnac and Luxor on the eastern bank, and the palace of Memnon on the western, the sepulchre of the kings, and the temple of Medinet Abu.


EGYPTIAN MUSEUM.

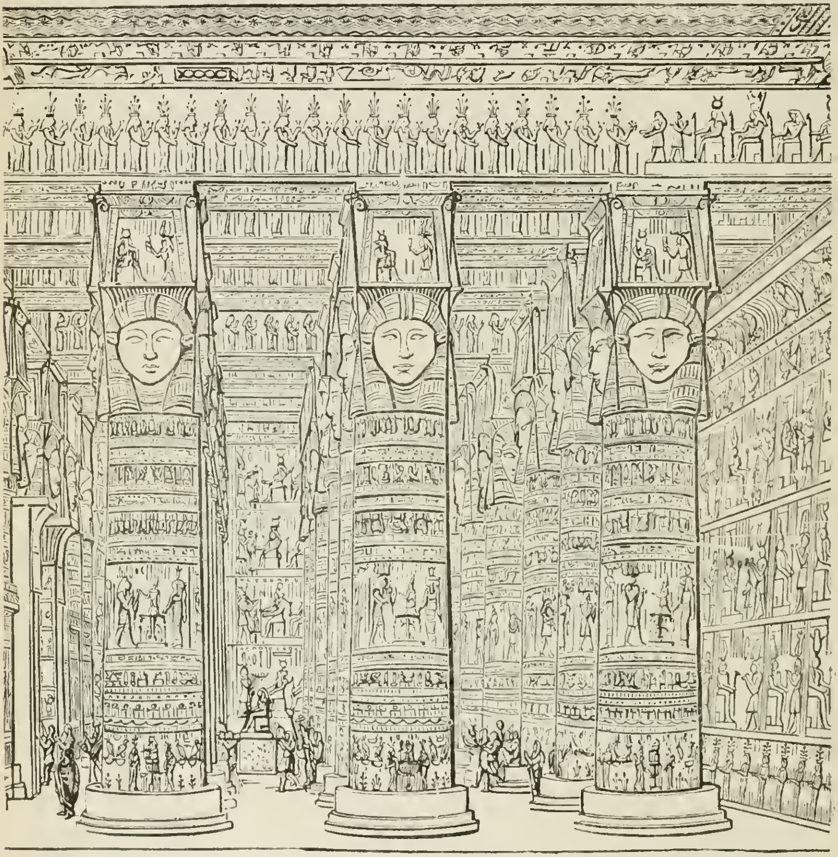
The temple of Carnac has twelve principal entrances; the body of the temple, which is preceded by a large court, is a prodigious hall, the roof being supported by one hundred and thirty-four columns, some of them no less than thirty-four feet in circumference; four obelisks mark the entrance to the shrines, which, built of granite, consists of three apartments. The temple of Luxor is not so extensive, but is considered to be of a superior style of architecture and in better preservation; at the entrance are two of the finest obelisks in the world, made of rose-colored granite, and rising to the height of one hundred feet. What most attracts attention are the sculptures on the east wing of the northern front, said to be a pictorial representation of a victory gained by some ancient king over his enemies. But to describe all the wonders of these amazing series of ruins would take volumes. Many learned men have made these and other relics, such as Rameses' Palace, the tombs, Pyramids, and labyrinths, their study, so as to try and master the history of a people and civilization dating so many hundreds of years back, even to the early morning of time, ere history began to be recorded. Hitherto the results of their labors have been most interesting and satisfactory, for in some measure they have enabled us to picture to ourselves cities as they were in that far-back time, when thronged with living men, women, and children.

SAILING UP THE NILE.

As the boat glides up the Nile towards the first cataract, every few miles sighting some object of interest, it often touches at a village or town on the banks, where on one side may be seen the fishermen's boats, hauled on shore, and on the other the white mud or stone-built houses, gleaming in the sunshine, fringed by palm-trees, while the ever-graceful minaret of the mosque of the Mohammedan points its finger to the sky.

The two most important cities in the country—Cairo and Alexandria—are both situated in Lower Egypt. Alexandria is seated on the Mediterranean sea-coast, and the ground-plan of the city was traced by the hand of Alexander the Great more than three hundred years before the birth of Christ. In the present day it contains a population of more than 200,000. It is divided into two sections, one of which is occupied by Europeans and the other by Arabs. The first is of recent date, and consists of broad and straight streets, many of them shaded by rows of fine trees, squares tastefully laid out with evergreen plants and sweet-scented flowers. The houses are well and solidly built, and many of them are large and commodious, while elegant shops abound, replete with both European and Eastern goods. At night the streets are lit by gas, and a company supplies the inhabitants with water from the Nile, which is said to be the best for drinking in all the world. The Arab quarter presents quite a contrast to the European, the streets being narrow and crooked, and so muddy in winter and dusty in summer as to make walking quite unpleasant, and sometimes even impossible. The houses are mostly of one story, and, with but few exceptions, present bare walls to the street.

To see real glimpses of Egyptian life a traveler must not linger in a coast city, or even the capital itself, but sail slowly up the Nile, visiting the various villages scattered along its banks. As the vessel glides smoothly along, we are struck by the verdant richness of the level plains, as contrasted with the rocky and sandy deserts by which they are bounded. The river itself contains but few of those rushes which anciently were so plentiful, and in which, as we are told in Genesis, the future lawgiver of Israel was hidden. Lady Duff Gordon, who



INTERIOR OF PORTICO OF THE TEMPLE AT DENDERAH, EGYPT.

traveled in Egypt, relates that, meeting a troop of graceful Arab women, carrying jars poised upon the head, they all wished her to go to their village and partake of food; while an old weaver, whose loom she walked in to inspect, wished to set a piece of bread before her.

The voyage terminates for a time at Cairo, the capital of Egypt; and that which first demands attention is the great citadel, which, standing on a slight elevation, commands the city. Some of the Government buildings are within its walls, and a splendid mosque containing the body of Mehemet Ali, that able yet unscrupulous man who nearly succeeded in shaking off his allegiance to the Porte. Meet it is that his remains should rest within the enclosure which witnessed his most terrible act of perfidy; for it was here that he massacred the Mamelukes.

FEROCITY OF THE MAMELUKES.

These Mamelukes were a brave but turbulent body of warriors, at one time so formidable from their number and daring, that they deposed the Egyptian Sultan and chose one of their own Beys to reign in his stead, and their rule lasted in Egypt for more than two hundred years. But when, in 1517, Selim the First destroyed their power, he appointed a Turkish Pasha as Governor; yet so mighty were they that this Pasha had to rule according to their will and pleasure. When the French invaded Egypt under Napoleon, these Mamelukes played a distinguished part; their furious attacks upon the army were with difficulty repulsed, and then only by the army forming into hollow squares. One officer who shared in the campaign says, "One of the Mamelukes entered the square near where I was stationed. The ferocity of this man was scarcely to be imagined. When he found himself to be encircled, he fought so desperately that his sabre was dripping with blood, his horse was in a violent perspiration, and wounded in several places with bayonets; but finding no hope of escaping, he threw his arms on the sand, and then dismounted, patted his horse's neck, and kissed it."

Because of their power, their bravery, and restlessness, Mehemet Ali determined on their destruction. Having defeated one portion with great slaughter, and driven many of them into Nubia, he still remained uneasy at the numbers left; orders were sent that the Mameluke Beys—to the number of four hundred and eighty—should be present at a grand ceremony, to be given in honor of his son, who was shortly to depart for Mecca. Not dreaming of treachery, they came on the day appointed, and were received within the citadel with all expressions of Eastean flattery; Ali called them the eldest sons of the Prophet, and invited them to celebrate with him the departure of his son for the holy tomb. Meanwhile, he had concealed a number of his most faithful troops upon the ramparts, the towers, and behind the walls of the fortress. At a signal the gates were closed, while the Pasha seated himself on a carpet on the summit of a terrace, smoking a magnificent Persian pipe, from whence he could see all without himself being seen. He gave the word to fire, and the massacre commenced. Encumbered with their arms, unable to reach their foes, they fell thick and fast; one alone survived, he being saved by his horse taking a leap over the breastwork of the citadel. The remainder in the provinces were also put to death. Such was the fate of the Mamelukes.

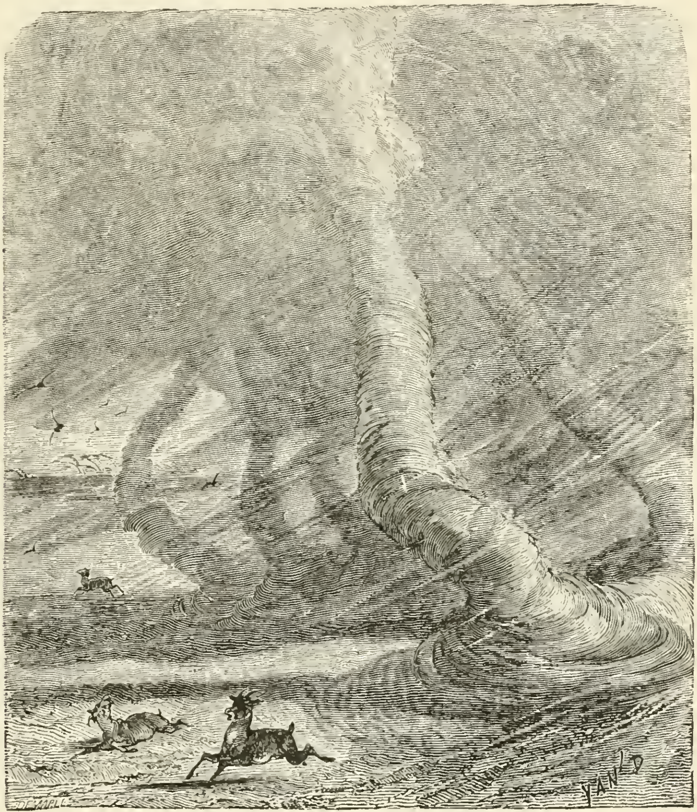
A splendid view of Cairo is gained from the walls of the citadel—the tapering minarets of four hundred mosques, a sea of houses, and in the background the yellow mountains of the desert. Behind the city lies a green plain, well watered by the Nile; and then, farther still, are seen the mysterious Pyramids, aloft in their awful grandeur, a witness at once to the power and vanity of man.

WHIRLWINDS IN THE DESERT.

It is a well-established fact that two thousand six hundred miles of desert in North Africa may be traversed without crossing a stream. There are dry sand, rock, and stone in abundance; but they are not covered with mould, and without this nothing can grow. The sand is often very dust-like, and the slightest breeze keeps the top of it on the move. It puffs upwards in the traveler's face as he walks, and irritates the eyes and skin. A gentle gale moves the sand in low clouds, and waves of it are formed to be destroyed and scattered about hour after hour. No road can be distinguished, on account of this constant movement of the sand; and the dead and dying, which the caravans leave behind, are soon covered up. They may remain under the sand until, during some terrific wind-storm, succeeding travelers hurrying on over the trackless waste see them white and fleshless, and are warned of their own danger.

The wind is the thing to be feared on the desert, and the heated soil, the absense of moisture, and the vast extent of the surface, where there is nothing to break the force of a moderate gale, combine to make its effects very terrible. Whirlwinds rush over the sand and twist it up in gigantic columns, darkening the noonday light, and the travelers are surrounded with clouds of dust moving on in the direction of the storm. The columns of sand are often many yards in height, and they move like waterspouts at sea. Woe to the caravan or the camp they overtake! for those that are not killed by the weight of the sand poured over them, are liable to be suffocated by the dust and the hot wind.

The bricks of Egypt are among the most interesting relics of antiquity, preserved, as it seems, in an imperishable form. A brick from the Pyramid of Bashour has been examined, which dates from between 3400 and 3300 B.C., and was found embedded among the Nile mud or slime, chopped straw, and sand of which it is composed, remains of animal and vegetable forms, and of the manufacturing arts, entirely unchanged. So perfectly, indeed, have they been preserved in the compact substance of the brick, that little or no difficulty is experienced in identifying them. By this discovery we are made acquainted with wild and cultivated plants, which were growing in the pyramid-building days; with fresh water shells, fishes, remains of insects, and so forth; and a swarm of organic bodies, which, for the most part, are represented, without alteration, in Egypt at the present time. Besides two sorts of grain—wheat and barley—were found the field pea and the common flax, the latter having, in all probability,



SAND-STORM IN NORTH AFRICA.

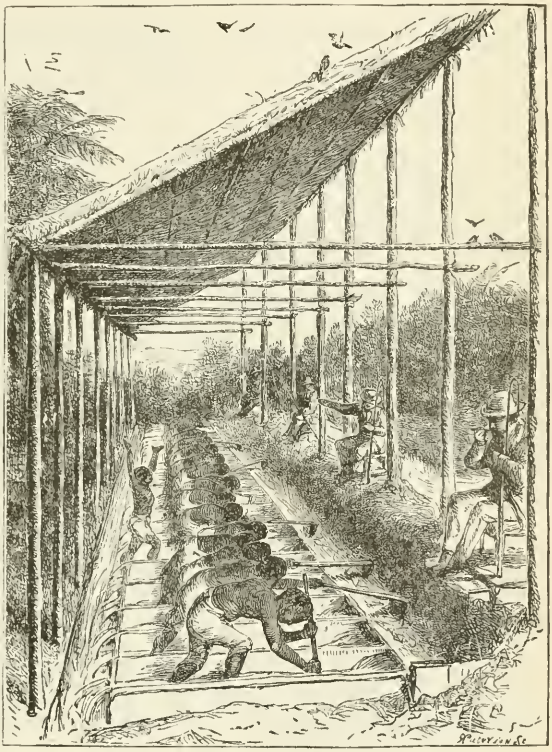
been cultivated as an article of food, as well as for spinning. The relics of manufacture consist of fragments of burnt tiles, of pottery, and a small piece of twine, spun of flax and sheep's wool, significant of the advance which civilization had made more than five thousand years ago. The presence of the chopped straw confirms the account of brickmaking as given in Exodus, and by Herodotus.

Egyptian architecture has always been a thing of wonder. While it is bold and massive, it is not without the most elaborate ornament, as may be seen from the workmanship on ancient temples, many of which are beautiful.

THE LAND OF DIAMONDS.

Not in Egypt alone have remarkable discoveries been made. Of late years attention has been turned especially to the southern part of Africa, where the search for precious stones has been amply rewarded. A great excitement prevailed in Cape Colony in the year 1867. A report was spread abroad that an African trader had purchased a diamond from a native, and had afterward disposed of it to the governor, Sir Philip Wodehouse, for no less a sum than two thousand five hundred dollars. Furthermore, it was rumored that a colonist had given all the.stock on his farm to a Bushman for a diamond which he showed him, and that the fortunate purchaser had obtained fifty-five thousand dollars for the gem. Then came the news that a native woman had dug up a diamond with her "kepo," a sharp pointed piece of wood, for which her husband had secured in exchange a wagon, oxen, and a load of goods. These rumors were at first received with suspicion, but their truthfulness being confirmed, there was an immediate rush to the district where these diamonds were to be found. Most of the frontier towns were speedily deserted; parties started from distant colonial towns, while at Cape Town, all sorts of conveyances were placed under contribution, from the heavy and lumbering ox-wagon to the light cart, which is the South African express, for transit to the diamond fields. In a few months, where before a scattered native population and a few Europeans existed, no less than ten thousand people were hard at work, eagerly hoping that some of the precious gems would fall to their share. The natives were astonished, and some said, "Who can understand you white men? You first clear off the elephants for the sake of the ivory, and the ostriches for their feathers, and when you have swept the country clean as to what is above ground, you then proceed to find treasures in the bowels of the earth?"

Situated in the very heart of Southern Africa lies the territory of Griqualand West, bordering on the great Kalahari desert, and extending over an area of sixteen thousand square miles. In the centre of this great plateau, at an elevation of three thousand feet above the sea, is the diamond-field country. It is bare and uninviting enough, except along the banks of the Orange and Vaal rivers, which are well wooded and picturesque. Diamond-fields were discovered on both sides of the Vaal river, at places named Klip Drift, Pniel, and Hebron, and also in the Orange Free State. In the last-mentioned places the dry diggings were very productive, being almost literally sown with diamonds. But it was on the Vaal, in Griqualand, that the most extensive fields were found.



WASHING DIAMONDS.

The scenes presented at these diggings were similar to those witnessed years before at the gold fields of California and Australia. Owing to the scarcity of wood, cantowns sprang up as if by magic, the mixed inhabitants of which would willingly toil all day in the dusty mines, and then spend the night in dancing, gambling and drinking. In the best days of diamond hunting, about sixty thousand people gathered round the dry and river diggings; but when the great rush was over, and it became a more settled industry, the population decreased to forty thousand.

The centre of operations is at the New Rush Mine of Kimberly, round which a town has been built, with a fine market-place, churches, clubs, assembly rooms, and hotels. This celebrated mine has the appearance of a hollow about three-quarters of a mile in circumference. Before it became a digging it had a slight elevation above the surrounding plain. It is now scooped out to a considerable depth, the lowest point reached being about two hundred and twenty feet.

Natives do a considerable deal of the mining work, laboring with pick and spade, loading buckets, which are hauled up and let down by ropes. These buckets are carried off to sorting grounds, where the stuff is thrown into sieves and carefully sieved, and afterward examined with the aid of a knife, or piece of tin, on a table in the open air.

In the earlier rush to these valuable fields the mode of procedure was as follows: Under the sanction of the Provisional Government, a piece of ground was marked off, called a "claim." The owner directly sets to work with pick and shovel to collect the soil into a heap. The loose stones are removed, and the sand separated by a fine sieve. The residue of earth and pebbles is then conveyed to the washing place on the bank of the river. The washing is accomplished by means of a "cradle," or "long Tom," the latter of which consists of two sieves, the upper one having holes about half an inch in diameter, while the under one is made so as to detain a diamond of about half a carat. After the washing follows the sorting process.

A NATIVE ATTACKED BY A TIGER.

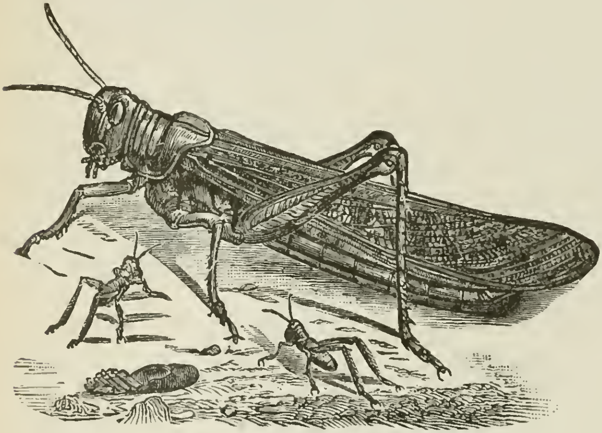
As possibly a rich fortune might be derived from a single gem, in the earlier times of the excitement many of these claims were sold for almost fabulous prices; in one instance half a claim, thirty feet by sixteen feet, already worked down to a depth of fifty feet, fetched as much as one hundred and twenty thousand dollars. And not seldom were these mines worth working, and not rare were the finds of lucky fortune-seekers; for we are told that an Irishman, after a few hours search, came upon a stone which he was able to pawn for fifteen thousand dollars, while another discovered, on an abandoned claim, one of one hundred and fifteen carats. One of the greatest diamonds found in these rich fields was named the "Star of South Africa," and, before cutting, was sold for fifty-five thousand dollars.

To the northeast of Cape Colony, separating it from Natal, is Kaffraria, a country rich in beautiful scenery, both of foliage and mountain, and abounding in all varieties of animal life. The larger animals, such as the lion and the elephant, have now retreated further inland, to be beyond the reach of the white hunters and settlers. Still, numbers of beasts of prey, including tigers, infest the thickly-wooded forests, lurking in their green retreats till darkness or hunger drives them forth to prey upon the cattle and upon the natives and settlers. Huge baboons, too, inhabit the tangled recesses of the bush, traveling in troops varying in size and number. Many are the stories told of these ugly misshapen creatures, their raids upon well-stocked gardens, and of their savageness when molested by man.

PURSUED BY BABOONS.

On one occasion the author of an interesting work on Kaffraria was making an excursion into the bush, about sixteen miles from King William's Town. His object was to visit some saw-pits situated deep in the forest. After transacting his business, he started alone upon a ramble deeper into the woods. The loveliness of the scene so charmed him that he was induced to go farther than he at first intended, and, leaving what is called the Kaffir path, he soon became entangled in the bush and underwood. The leaves over his head were so thick as to hide from him the sun, so that he was compelled to have recourse to his pocket-compass; but while adjusting this, he was surprised by receiving a salute of broken sticks and berries. Wondering what such an attack could mean, he peered up into the foliage over his head, but seeing no animals he continued his occupation, when a second volley made him desist, and turn in all haste to seek the lost path. The chattering overhead soon told him that his assailants were a large troop of baboons. Having got clear of the thicket, he thought that now he might retaliate upon his enemies. He therefore commenced throwing stones at those who were within reach; but, to his dismay, instead of taking to flight, he saw, from every tree near him, five or ten of the ugly creatures swinging from branch to branch and dropping upon the ground, with the evident intention of making a personal attack. Unarmed, and totally unable to cope with such monsters, he thought the best thing he could do was to turn and run, or his life would not be worth many minutes' purchase. This he accordingly did, with the whole troop in full cry after him. He never ran so fast in his life, while at the same time he bitterly regretted his ill-advised attack. At the saw-pits he hoped to gain assistance, but found the men had gone to dinner; nothing was to be done but to increase his speed, and try to outdistance his pursuers. This he finally accomplished, and never again ventured, when unarmed and alone, to attack a troop of baboons.

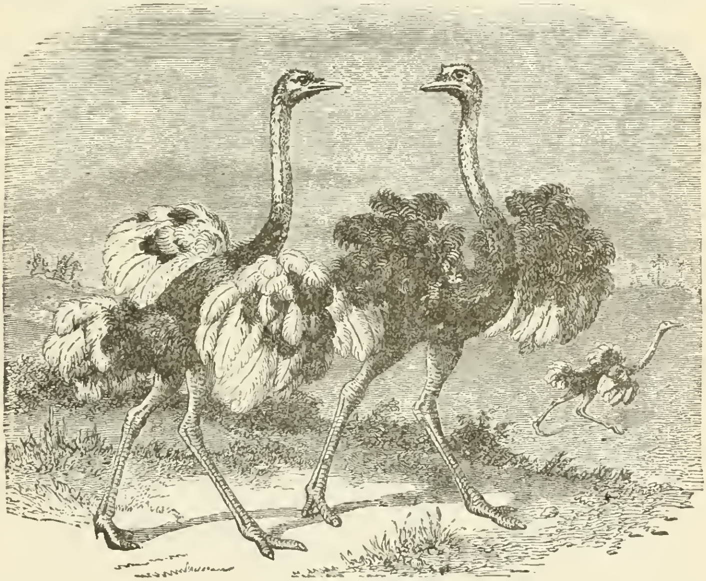
One of the great scourges of Kaffraria, and also of other parts of Southern Africa, is the periodical visits of immense flights of locusts. They are common to nearly all eastern countries, and work their ruin by the sheer power of numbers. The Bushmen eat them, and consider them a great delicacy; but the ruin they effect is something dreadful to think of. In one of these periodical visits, we are told, the sun at midday was quite darkened by their flight, and the whole country for miles was covered by them. When they alighted upon the ground, they lay there ten and twelve inches deep; if disturbed, they arose in such dense clouds as to prevent any one moving forward through them without the face and eyes being endangered. Wherever they alight, all the vegetation disappears—leaves, vegetables, fruit and corn—leaving nothing but desolation behind. Whenever they are seen approaching, the Kaffirs light large fires in all directions, so that the heat and smoke may make them pass on. Horses, dogs, cats, and poultry eat them with avidity, while the Bushmen collect and save them in large quantities; grinding them between two stones into a kind of meal,



THE LOCUSTS.

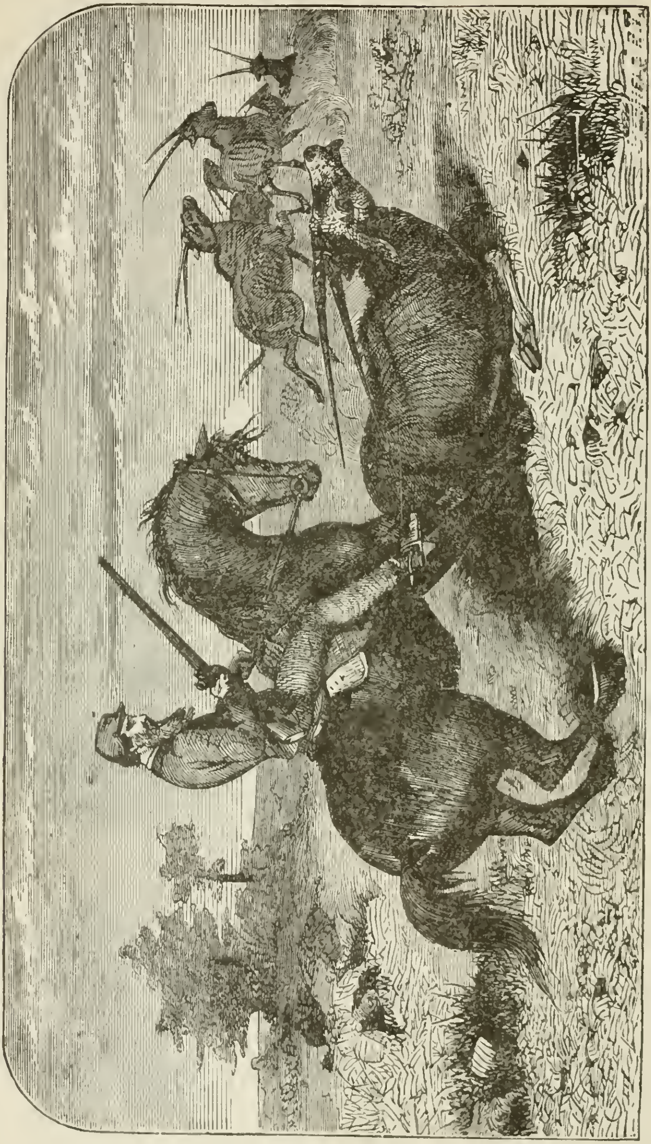
they mix with them fat and grease, and then bake them in cakes, and upon these they live for months together. The Kaffirs dread the approach of the locusts, but the Bushmen hail their appearance by clapping of hands, leaping, and every manifestation of joy.

A valuable export from the Transvaal consists of ostrich feathers. Vast quantities are annually sent to England, and to supply the demand thousands and tens of thousands of these birds fall victims to the hunters. Both in the Cape Colony, Transvaal, and the Orange Free State one of the most singular enterprises is that of ostrich farming. The idea appears to have been borrowed from the French, who tried it in Algeria. All over the several colonies are now seen flocks of ostriches. Farmers buy and sell them as they do sheep; fence their flocks in, stable them, grow crops for them, study their habits, and cut their feathers. At eight months old the birds begin to feather, and their plumes improve in value with each season, the feather being nipped or cut, not plucked, as they come to maturity. In 1874 no less than one million dollars' worth of these feathers were exported from Cape Town.



THE OSTRICH.

Although ostriches have a somewhat stupid look, they are more on the alert than is supposed. Timid in their wild state, domesticated they are bold and dangerous. They will attack a man without any provocation; raising their foot and striking forward, they will cut your clothes the whole length of the stroke. The only safe plan for the assailed to pursue is to lie down on his face; the bird cannot kick, but amuses itself by trampling all over you.

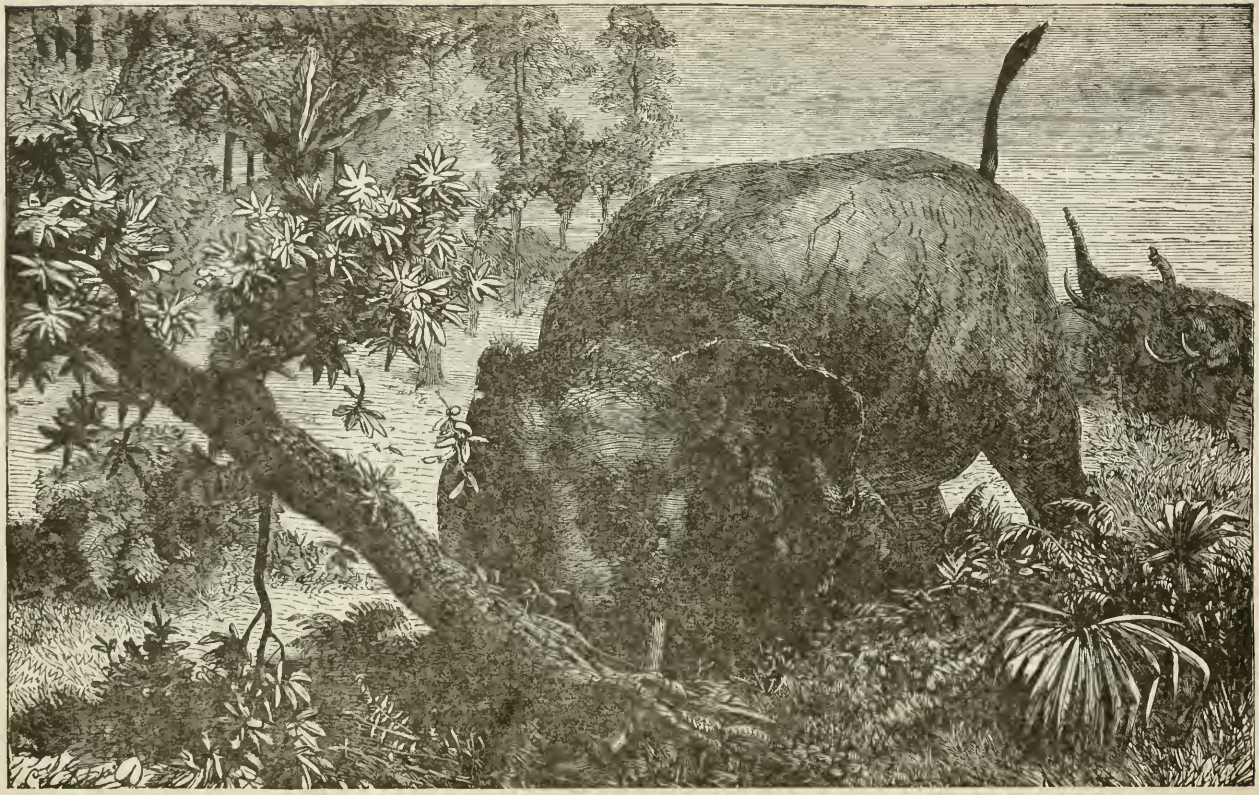


HUNTING THE GEMSBOCK.

The African lion, however, is not always so tender of his prey. The Transvaal has been called the paradise of the hunter, where game of all sorts and in vast profusion is found—zebras, the springbock, the steinbock, gnus, and others too numerous to mention, beasts of prey as well as inoffensive creatures. The elephant, rhinoceros, hippopotamus, buffalo, and giraffe, and such large game, have retreated before the white man farther into the interior. The lion is still met with, fierce and dauntless as ever, although seldom attacking man unless disturbed or driven by hunger. On the extreme frontier of the Transvaal flows the Limpopo river, beyond which was the scene of Gordon Cumming's hunting exploits, of which aged natives still talk with wonder and admiration. The boomslang tree still stands with his name cut deeply in the bark, and that of other African hunters as well. It was while encamped beneath this tree, that his faithful driver, Hendrick, was seized and carried off by a lion. He had arisen in the night to drive in a wandering ox, and lay down again by the fire with his back to the forest. The lion had evidently watched his movements; for no sooner had he resumed his position by the fire than the brute sprang upon him, and grappling him with his fearful claws, kept biting him on the breast and shoulders, all the while feeling for his neck, which when he succeeded in griping he at once dragged him into the bush. In the morning search was made for the unfortunate driver, but only a leg and fragments of clothes were found.

DREADFUL ENCOUNTER WITH AN ELEPHANT.

Hunting large game is not unattended with danger; the ferocious beasts, when wounded, turn upon their assailants with savage fury, and the hunter has need of all his coolness and presence of mind to avoid a fatal termination to his sport. We have a very graphic instance of this in the case of Lieutenant Moodie, when hunting elephants in Southern Africa. He had set out to join a party of sportsmen, when he lost his way in the jungle; but hearing shots at some distance he made for the spot, when, says he, I was suddenly warned of approaching danger, by loud cries of "*Passop!*"—Look out!—coupled with my name in Dutch and English; and at the same moment heard the crackling of broken branches, produced by the elephants bursting through the wood, and the tremendous screams of their wrathful voices resounding among the precipitous banks. Immediately a large female, accompanied by three others of a smaller size, issued from the edge of the jungle which skirted the river margin. As they were not more than two hundred yards off, and were proceeding directly toward me, I had not much time to decide on my motions. Being alone, and in the middle of a little open plain, I saw that I must inevitably be caught, should I fire in this position and my shot not take effect. I therefore retreated hastily out of their direct path, thinking they would not observe me, until I should find a better opportunity to attack them.



AN ELEPHANT ROOTING UP A TREE.

But in this I was mistaken, for, on looking back, I perceived, to my dismay, that they had left their former course, and were rapidly pursuing and gaining ground on me.

Under these circumstances, I determined to reserve my fire as a last resource; and, turning off at right angles in the opposite direction, I made for the banks of the small river, with a view to take refuge among the rocks on the other side, where I should have been safe. But before I got within fifty paces of the river, the elephants were within twenty paces of me, the large female in the middle, and the other three on each side of her, apparently with the intention of making sure of me; all of them screaming so tremendously that I was almost stunned with the noise. I immediately turned round, cocked my gun, and aimed at the head of the largest—the female. But the gun, unfortunately, from the powder being damp, hung fire till I was in the act of taking it from my shoulder, when it went off, and the ball merely grazed the side of her head. Halting only for an instant, the animal again rushed furiously forward. I fell—I cannot say whether struck down by her or not. She then caught me with her trunk by the middle, threw me beneath her forefeet, and knocked me about between them for a little space. I was scarcely in a condition to compute the number of minutes very accurately. Once she pressed her foot on my chest with such force that I actually felt the bones, as it were, bending under the weight; and once she trod on the middle of my arm, which fortunately lay flat on the ground at the time. During this rough handling, however, I never entirely lost my recollection, else I have little doubt she would have settled my accounts with this world. But owing to the roundness of her foot, I generally managed, by twisting my body and limbs, to escape her direct tread.

While I was still undergoing this buffeting, Lieutenant Chisholm, and Diederik, a Hottentot, had come up, and fired several shots at her, one of which hit her in the shoulder; and at the same time, her companions, or young ones, retiring, and screaming to her from the edge of the forest, she reluctantly left me, giving me a cuff or two with her hind feet in passing. I got up, picked up my gun, and staggered away as fast as my aching bones would allow; but observing that she turned round, and looked back toward me before entering the bush, I lay down in the long grass, by which means I escaped her observation.

On reaching the top of the high bank of the river, I met my brother, who had not been at this day's hunt, but had run out on being told by one of the men that he had seen me killed. He was not a little surprised at meeting me alone, and in a whole skin, though plastered with mud from head to foot. While we were talking of my adventure, an unlucky soldier attracted the attention of a large male elephant, which had been driven toward the village. The ferocious animal gave chase, and caught him immediately under the height where we were standing, carried him some distance in his trunk, then threw him down, and, bringing his four feet together, trod and stamped upon him for a considerable time, till he was quite dead. Leaving the corpse for a little, he again returned, as if to make quite sure of his destruction, and, kneeling down, crushed and kneaded the body with his forelegs. Then, seizing it again with his trunk, he carried it to the edge of the jungle, and threw it among the bushes. While this tragedy was going on, my brother and I scrambled down the bank as far as we could, and fired at the frenzied creature; but we were at too great a distance to be of any service to the unfortunate man, who was crushed almost to a jelly.

Most of the settlers in the Transvaal are noted hunters and splendid shots. The particular game they chiefly search after is the buffalo, a more dangerous beast than is generally supposed, for he is as cunning as a fox, as stealthy as a cat, almost as swift as a horse. He never knows when he is beaten; for riddle him with bullets, he will still charge you, and show fight, until some lucky shot touches him in a vital part. When Mr. Parker Gillmore was once on the trail of the elephant, five buffaloes charged right into the midst of his men. His own horse jumped over a bush and placed him in safety; but when he turned round to see what mischief had been done, he saw one poor fellow turning a somersault in the air, and another hanging by his hands from the branch of a tree, beneath which an infuriated animal was vainly charging backward and forward at him.

CHAPTER VII.

WONDERS OF CHINA.

The Great Wall—Pekin—Pagodas—Chinese Mottoes and Signs—Curious Conveyances—Puppet Shows—Imperial Navy—Temples and Idols—Veneration for the Aged—Wonderful Porcelain Tower—Vases and Screens—Small Feet of Chinese Ladies—Social Customs—Dinner to General Grant—Chinese Wedding—Dress—Treatment of Criminals—Punishment by Decapitation.

ONE of the early emperors of China devised a way for defending his dominions from the Tartars, who were making constant inroads, and waging a relentless warfare. He erected a great wall along the whole extent of the northern frontier of China, of very great height, thickness, and strength, made of two walls of brick many feet apart, the space between them being, for half the length of the wall, filled up with earth, and the other half with gravel and rubbish. On it were square towers, which were erected at about a hundred yards' distance from one another. Some say this wall extended one thousand five hundred miles from the sea to the most western provinces of Shensi; the best authorities pronounce it to be one thousand two hundred and fifty miles in length. It was carried over mountains and across rivers. Six horsemen could ride abreast upon it. But there was great cruelty practiced in its construction, for the Emperor obliged every third laboring man in the kingdom to work at this wall without payment. It took five years to finish, and has now existed for more than two thousand years.

The material in the Great Wall, including the earth in the middle of it, is said to be more than enough to surround the world with two walls six feet high and two feet thick. Guards are stationed in the strong towers by which the wall is fortified; every important pass having a strong fortress. The height of the wall is about twenty feet; and there are steps of brick and stone for men on foot to ascend, and slanting places for cavalry.

In addition to the Great Wall, China can boast of the most remarkable city in Asia. Pekin ranks as the second city in the world, only London having more inhabitants, Paris about the same number. There are about two million inhabitants. As Pekin was built many centuries before the Christian era, it is a very old city. The name means Court of the North. After the conquest by the Tartars of the kingdom of Yen, of which Pekin was the capital, it became only a provincial town, when, at the beginning of the fifteenth century, it was again made the capital of China. The Chinese sovereigns used to live at Nankin, but when the Tartars had so often invaded the country, they removed to the northern province, to enable them the more easily to keep out the invaders.

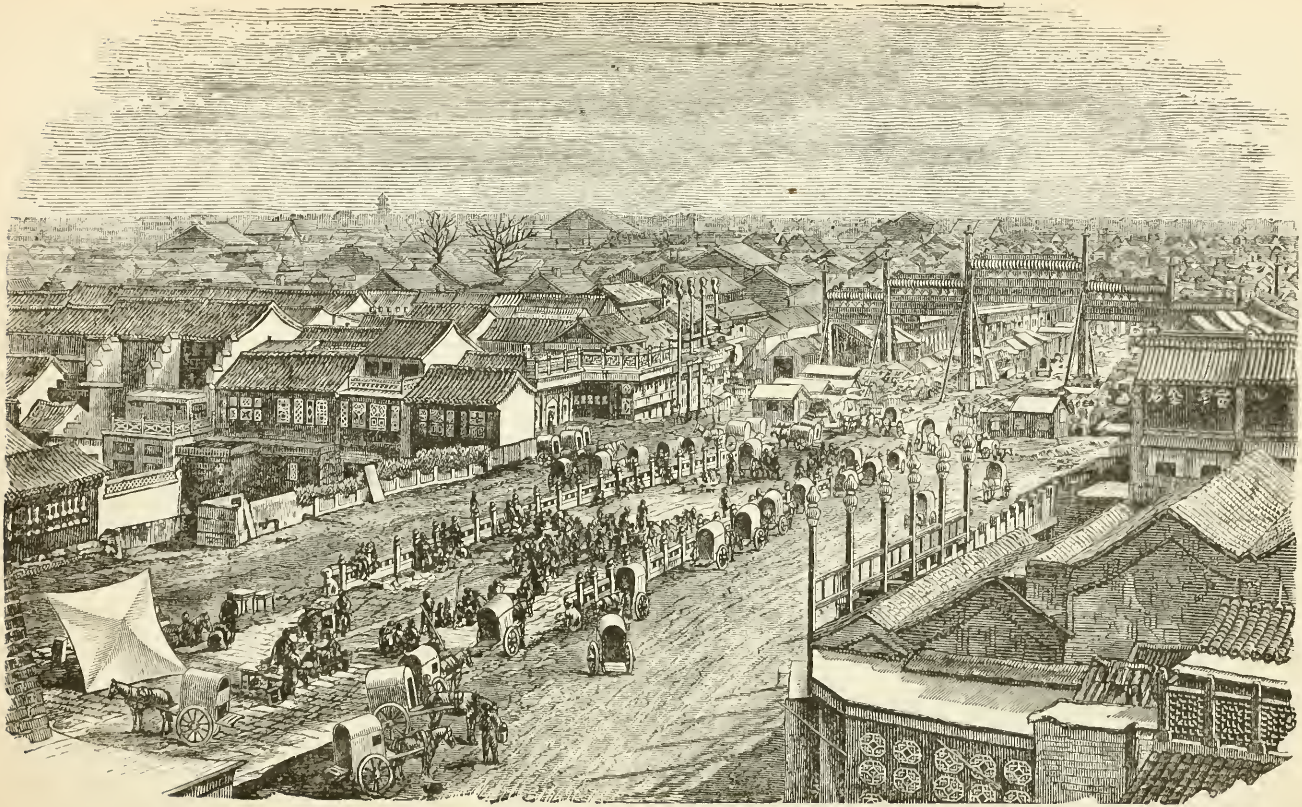
Pekin is situated in a large sandy plain on a small tributary of the river Peiho. This city is again divided into the Chinese and Tartar cities, the Imperial city, in which live the emperor and his retainers, and another in which the court officials have their residence. Like all other Chinese cities, they are surrounded by high walls. At the north, south, east, and west sides of towns are large folding-gates, which are often further secured by three inner gates. The one in the south is that of honor, through which the emperor passes, but which is usually kept closed at other times.

DEFENSES OF THE GREAT CITY.

The wall of Pekin, which is sixteen miles round, has two gates on three sides and three on the other, of which the principal is Chean-Mun, at the south of the Tartar city. Over the gate is a building occupied by soldiers, who are there for purposes of defense. The streets in Pekin are very broad. They are raised in the centre, and covered with a kind of stone, to form a smooth, hard surface. In summer they are often very dusty, and during the rainy seasons very dirty. At the end of each street is a wooden barrier, which is guarded day and night by soldiers. The barrier is closed at nine o'clock at night, after which time the Chinese are only allowed to pass through if they have a very good reason to give for being out so late. Order is well kept in the streets of Pekin by the soldiers and police, who may use their whips on troublesome customers whenever they think it necessary to do so.

The principal streets, or main thoroughfares, extending from one end of the city to the other, are its only outlets. Trees grow in several of these streets. Houses in which the inhabitants live, are in smaller streets or lanes, the houses themselves being often shut in by walls. Pagodas (temples to the gods, built in the form of towers), monasteries, and churchyards, are all outside of the walls, and the city itself is principally kept for purposes of commerce.

There is a great noise in some of the streets, for instance in the Hata-mène-ta-kie, where many people are to be seen bustling about and talking very loudly to one another. Tents are here put up in



STREET SCENE IN PEKIN, CHINA.

which rice, fruit, and other things are sold, and any one wishing for a pretty substantial meal can be supplied with it, for before stoves stand the vendors of such meals, who have cooked them ready for purchasers. Other tradesmen carry hampers, slung across their shoulders, in which they keep their goods, calling out, from time to time, to let people know what these hampers contain. Carts, horses, mules, wheelbarrows, and sedan-chairs pass along, the whole place seeming to be alive with buyers and sellers. The cobbler is sure to be somewhere close at hand in his movable workshop, and first here and then there, as may best suit himself and employers, the blacksmith pitches his tent, which sometimes consists of a large umbrella; whilst, again, people can refresh themselves, if they do not care for a heavier meal, with some soup or a patty at a soup stall.

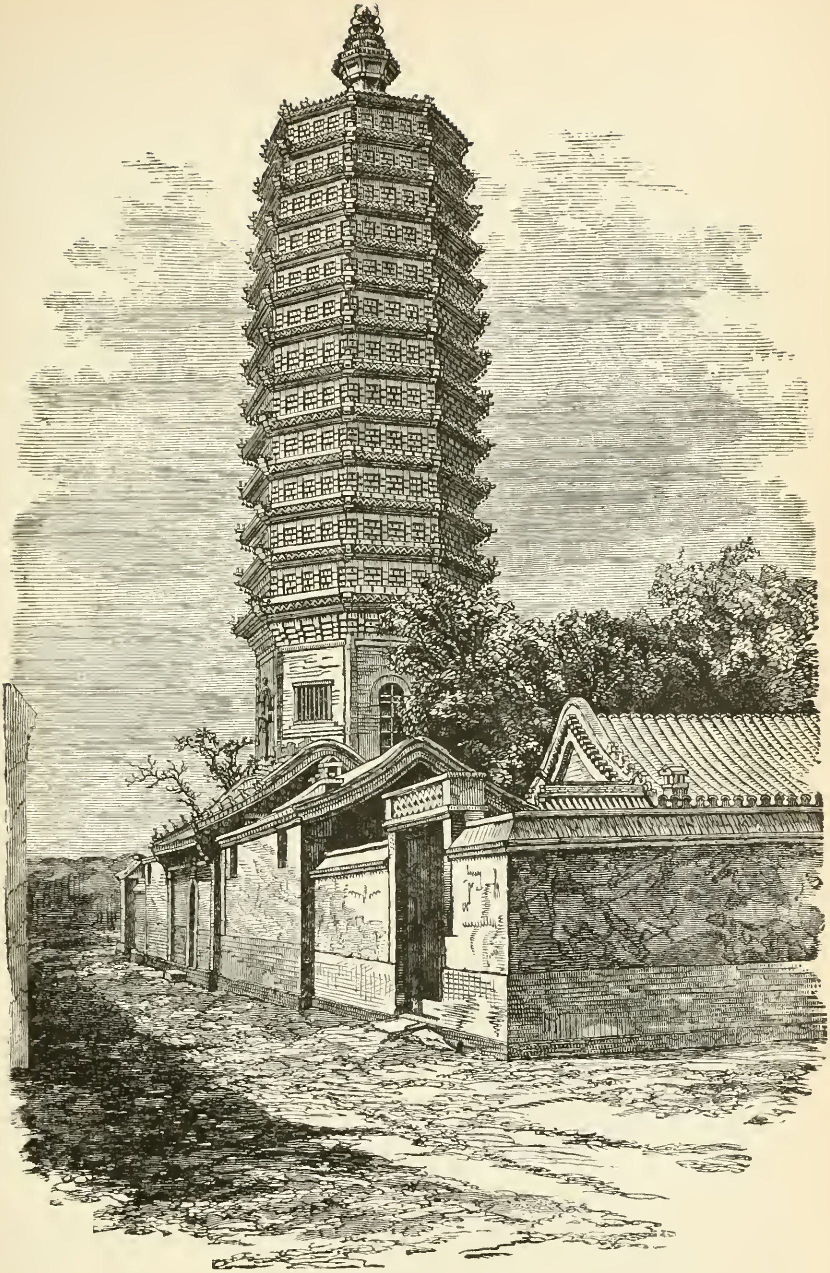
And the barber does not forget that he is a very useful person. There, in the open streets, he communicates, by the tinkling of a little bell, the fact that he is ready to shave the heads and arrange the cues or pig-tails of those who may require his services; and as one man after another takes the seat that is ready for him, the barber not only shaves and plaits, but also frequently paints his customers eyebrows and gives his clothes a brush.

After the Chinese were conquered by the Tartars they were obliged to wear the pig-tail, to show that they were in subjection to their conquerors; but now the pig-tail is held in honor, and the longer it will grow the better pleased is the Chinese gentleman who wears it. Some very bad criminals have their hair cut off as a great punishment and disgrace.

Most of the shops in China are quite open in front; but in Pekin many have glass windows. In China there are certain streets for certain shops, where the different branches of trade have generally their own sides of the road. A shop is called a hong. Sometimes the master sits outside, waiting for his customers to arrive. At the door of each hong are sign-boards, upon which are painted in gold, or colored letters, a motto instead of a name, and what the shop offers for sale. A motto often seen contains the following words:

Teën
Fung **Yee** Poo
Seih **Shun** Tian
Teen

The four largest characters, which form the motto, may be taken to signify that "Heaven favors the prudent." The other smaller characters designate the nature of the business, a cushion and matting manufactory; the last character, without which no sign-board is complete, meaning shop or factory.



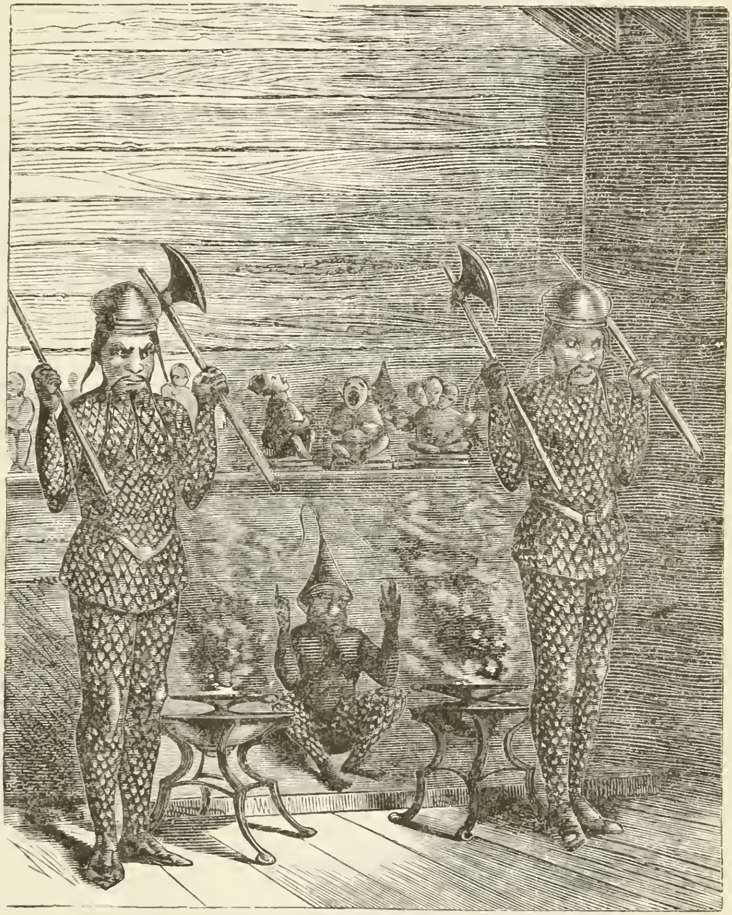
A CHINESE PAGODA.

In China may be seen both shut and open carts, the latter being used as carriages. Those in common use are made of wood, the body of the cart resting on an axle-tree, supported by the wheels. Horses and mules are very little used in China, except for traveling and for conveying luggage long distances. Horses and ponies require very little guiding. Sometimes they go without reins, when their masters will perhaps walk beside them, carrying a whip. There may also be seen very polite drivers, who, whenever they meet a friend, jump off their carts, and walk on foot to pass one another. Government servants generally use ponies, but as China is so densely populated—having, it has been estimated, about four hundred million inhabitants, and people find it so hard to obtain enough to support themselves and families—they keep as few beasts of burden as possible. The farmer employs the bullock a great deal, and in the north of China the camel is also much used. Much trade is carried on by boats, and where there is no water, and farmers are without other conveyances, they will sometimes push their wives along the roads in wheel-barrows, sons giving their parents similar drives. In many parts of China there are few carriage roads. The Chinese have all kinds of boats for use on their rivers. A junk has sails like butterflie's wings. But the kites made by the Chinese are very curious. They are like birds, insects, animals, clusters of birds, gods on clouds: all kinds of things, in fact, are represented by these kites, which the Chinese are most clever in making, and also in flying. Old men, seventy years of age, may be seen thoroughly enjoying flying their kites. The Chinese do not care much for our favorite games. They are very fond of battledore and shuttlecock, but instead of using a battledore, they hit the shuttlecock with their heads, elbows, or feet. Seven or eight children play together, and nearly always aim the shuttlecock rightly. Girls play at this game too, in spite of their small feet. Tops, balls, see-saws and quoits are also favorite toys and games among the Chinese.

Puppet shows they exhibit in the streets, amusing the spectators. The pictures in these shows are exhibited by means of strings, which are either worked from behind or from above the stand, and as the people look through a glass, the views are displayed to them. A man standing at the side calls out loudly, and beats a little gong to summon people to attend the show.

In winter the people of China sleep on kangs to keep themselves warm. The kang consists of a platform built of brick, so much larger than a bed that several people can sleep on it at once. A kind of tunnel passes through the platform, which has a chimney at one end, while at the other end, a little while before bed-time, a small quantity of dry fuel is set on fire, when the flame passes through the tunnel and out of the chimney. In this way the kang is warmed, when felt matting is put upon it. The covering is a kind of cotton-wool counterpane, is light, at the same time affording comfort.

The Imperial Chinese Navy is divided into river and sea-going vessels, the full complement consisting of nearly two thousand of the former, and one thousand of the latter, with about two hundred thousand sailors. Ships generally fly a flag at the main, on which red lines are drawn, or sometimes a tri-color is hoisted there instead. Red would be for safety, as this is the lucky color of the Chinese. At the stern



INTERIOR OF A CHINESE TEMPLE, SHOWING THEIR IDOLS.

of the vessel may be seen the name of the official who directs and superintends the ship.

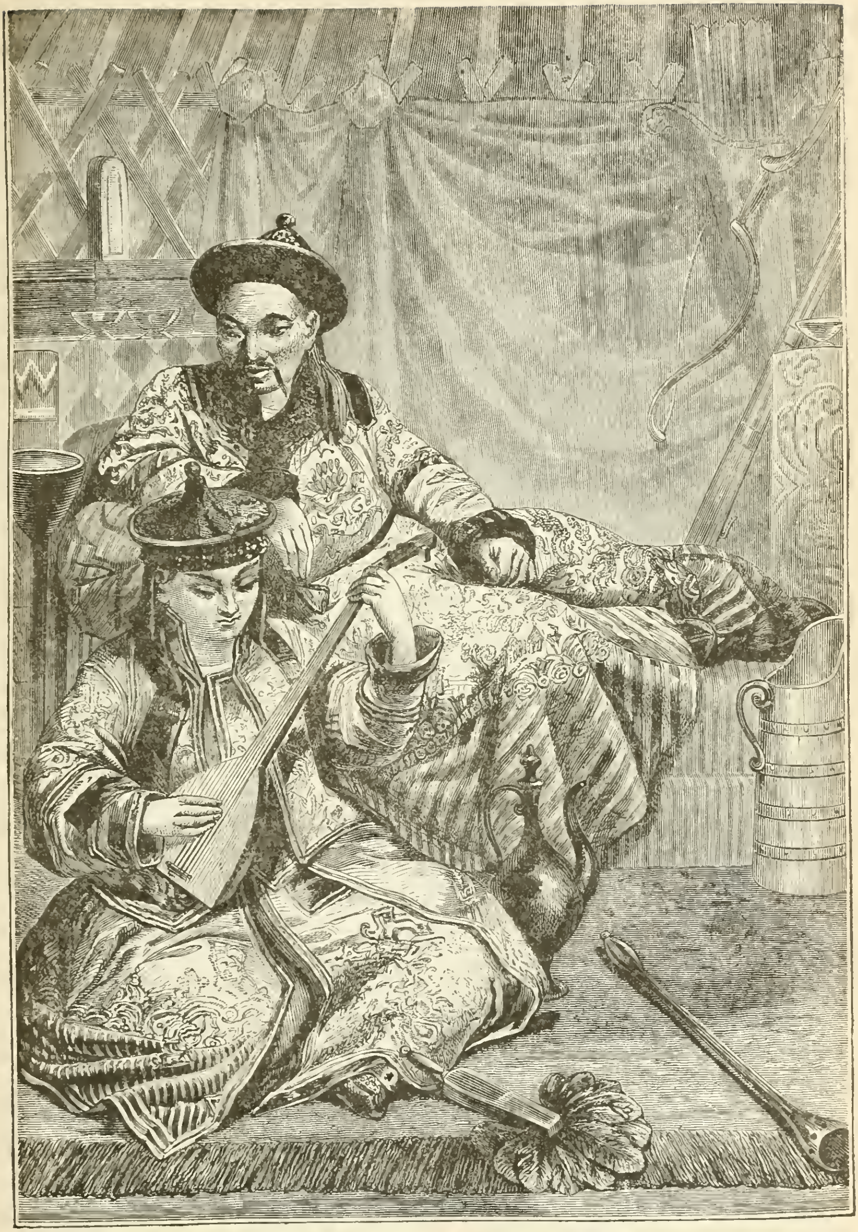
As to religion most of the Chinese are either Confucianists, Buddhists, or Taouists, although there are also Jews and Mahometans amongst them. At one time it is supposed the people of China worshipped in much the same manner as did the Hebrew patriarchs. But mixing with this an idolatrous worship of departed ancestors, they nearly lost sight of Wang-teen, the Supreme Ruler.

About the latter half of the sixth century before Christ, Confucius, a great and clever philosopher of China, who was born 551 B.C., wrote and put together books that held very moral and good maxims, afterwards called "The Classics." He taught that men must always be obedient to those to whom they are in subjection: people to prince, child to parent, filial piety being enforced before every other duty. He was very anxious to improve the manners of the people; but women he ranked very low. Confucianism is more a philosophy than a religion. Its followers have no particular form of worship, and no priesthood. The Pearly Emperor, Supreme Ruler, is their deity, but worship is seldom offered to him, and then only by a few. Although Confucius disapproved very much of idols, after he was dead many of his followers worshipped him.

CURIOUS RELIGIOUS BELIEFS OF THE CHINESE.

Confucianists do not believe in a future state of rewaras and punishments, but think that their good and bad deeds will be rewarded here by riches or poverty, long or short life, good or bad health. Conscience is to lead people aright, and tell them when they do wrong. The high mandarins and literary people are generally Confucianists; schoolboys also worship an idol or tablet of the sage, in which his spirit is supposed to dwell. There is a temple to the honor of "The Great Teacher" in every large town; and on great occasions, and always in spring and autumn, sacrifices are here offered, the Emperor himself, as high priest, presiding at some of these ceremonies.

Mandarins are Chinese officials, of which there are many grades, and many in each grade, all of whom are paid by Government. To every province there is a viceroy, to every city a governor, and to the village a mandarin, who is elected to rule over it for three years; and all these, again, have many officers under them. There are also a great many military mandarins. A great mark of imperial favor is to allow mandarins, civil or military, to wear a peacock's feather in their caps, which hangs down over the back, and the ball placed on the top shows, by its color and material, the rank of the wearer. Soldiers fighting very bravely are often buoyed up with the hope of receiving



CHINESE MANDARIN AND HIS BRIDE.

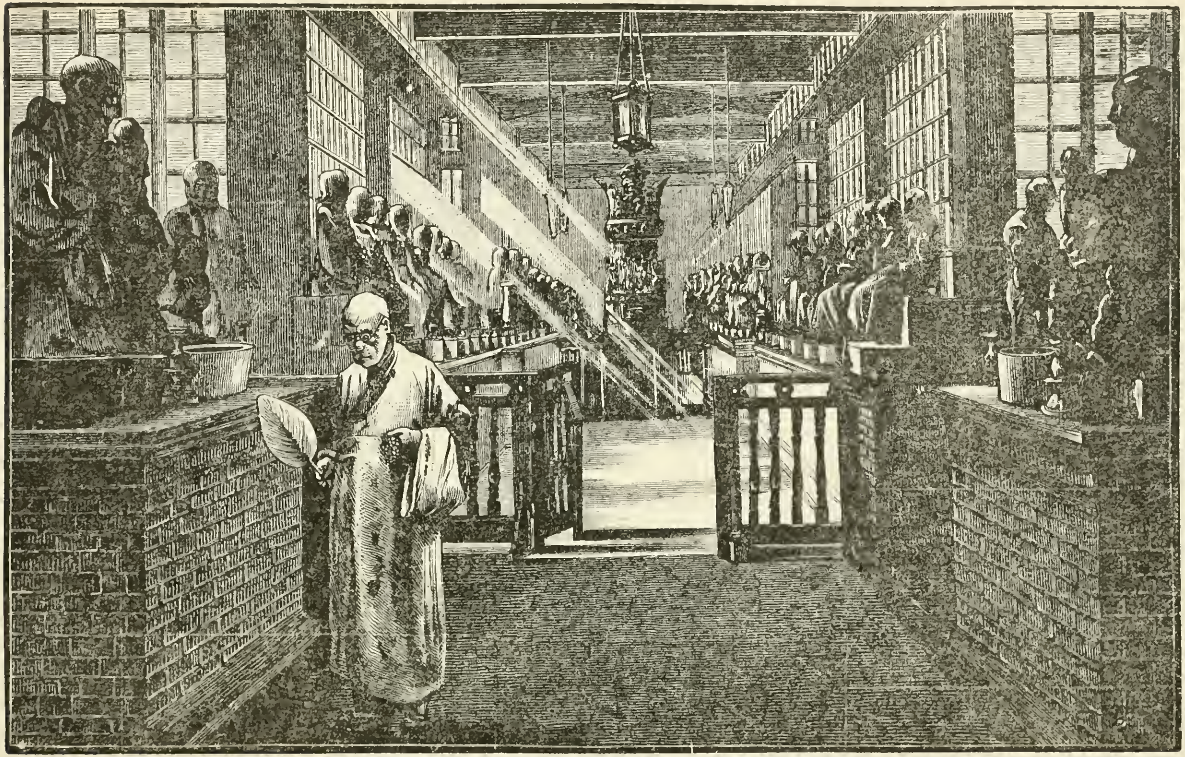
one of these feathers. Mandarins, who stand in a sort of fatherly relationship toward their people, although they do not always behave like fathers toward them, look for implicit obedience from them. Mandarins who are in high office, wear a long, loose robe of blue silk, embroidered with gold threads. This reaches to their ankles, being fastened round their waists with a belt. Over this is a violet tunic, coming just below the knees, which have very wide, long sleeves, usually worn turned back, but if not, hanging over the hands. The Buddhism of China is not at all the pure Buddhism, and has been much corrupted by its professors. The founder was an Indian prince, of beautiful character, born 620 B.C., and called Shâkyamuni Buddha, who left wealth and luxury to go about relieving suffering wherever he found it. After he died his followers believed that he was transformed into a god, having three different forms.

A GREAT VARIETY OF DEITIES.

Some of the gods are a god of rain; a god of wind; a god of thunder; a god of wealth, the latter worshiped very much by tradesmen; a god of thieves; a goddess of thunder; a guardian goddess of women and little children, called Kum-fa, whose ten attendants watch over children, helping them to eat, and teaching them to smile and walk; a god of wine; a god of fire; a goddess of mercy; a goddess of sailors; a goddess of children, called "Mother;" a god of the kitchen; a god of measles; a god of small-pox. Then the Confucianists worship two stars, who are supposed to look after literature and drawing, the former called the god of literature. And besides household gods belonging to every family, there is a god of the passing year, and numerous others. Many of the gods are deified persons.

There is another form of Buddhism, called Lamaism, and this, though it prevails principally in Thibet and Mongolia, has also its followers in Pekin. The Great Lama, or Living Buddha, is the head of this. His soul is said never to die; therefore, when he dies it is supposed to pass into an infant whom the priests select by a likeness that they trace to the late Lama. In the centre of a Lama temple facing the worshipers, is a very large idol of Buddha. To the right and left of the temple are smaller idols. Some gods in temples do not receive worship, but guard the doors. Incense is burning in front; the high priest, to the right, is lifting up his hands in adoration, whilst the people offer scented rods and tapers to Buddha. As they light their offerings they kow-tow, or hit their heads upon the floor. This is the Chinese way of reverent, respectful salutation. The devotees are grouped in squares.

The Sun and Moon are also worshiped. At Pekin there is a temple



TEMPLE OF FIVE HUNDRED CHINESE GODS.

of the Moon. On the day of the autumnal equinox, at six o'clock in the evening, a very solemn sacrifice is offered, and the great ladies of the capital meet to burn tapers. This temple is approached by a long avenue of beautiful trees. The building is large; but more women than men come to attend the ceremonies.

The more enlightened heathen only regard their idols as representations of the Deity they are feeling after, but many of the simpler sort, in different degrees, regard their idols with great religious awe. Then, many Chinamen, again, often seem to have no religion at all. Confucius having for nearly twenty centuries held such a sway over the minds of the Chinese, they do not care to listen to new teachers. They had a literature seven hundred years before Christ.

REMARKABLE VENERATION FOR THE AGED.

The sacred regard which Chinese pay to the claims of kindred, secures to the patriarchs of respectable families ample support in the advanced and helpless stage of their pilgrimage; and charity often relieves poor septuagenarians whose relations may be unable to supply them with comforts or necessaries at their mature age. In China one's feelings are not harrowed with the sad spectacle of an aged parent discarded by his children, and left to perish, unattended and unnursed, under a scorching sun, or on the banks of a rolling river. But you will see the tottering senior, man or woman, who has not the means to hire a sedan, led through the alleys and streets by a son or a grandchild, commanding the spontaneous respect of each passer-by, the homage of every junior.

The deference of the public to the extreme sections of old age is manifest likewise from the tablets and monuments you may any day stumble upon, that have been erected by public subscription to the memory of octogenarians, nonagenarians, and centenarians. Nor is the government backward in encouraging this, but the reverse. Hence may often be seen very aged men and women in the streets, arrayed in yellow, that is, imperial, robes, the gift of the emperor, in mark of honor, and out of respect to their gray hairs. The reader will remember that an honorary degree is given to competitors who have reached an advanced age, a kind of prize for long life.

On one occasion, the emperor called together about four thousand old men at his palace, entertained them with a banquet, at which they were served by his own children and grandchildren, presented each of them with money and a yellow robe, and conferred upon the oldest of the assembly, a man aged one hundred and eleven years, the rank and dress of a mandarin, to reward him for being so old.

In every town or village, the oldest persons are treated with the greatest consideration, not on account of their rank or wealth, but of their age. Every one gives way to them, they have the best places in the theatres, are brought forward at every public spectacle, and are indulged in every possible way. Such has been the custom from time immemorial in this great nation, which was civilized when the inhabitants of England were naked savages. The oldest civilized nation in the world, they have honored their fathers and their mothers, and their days have been long in the land.

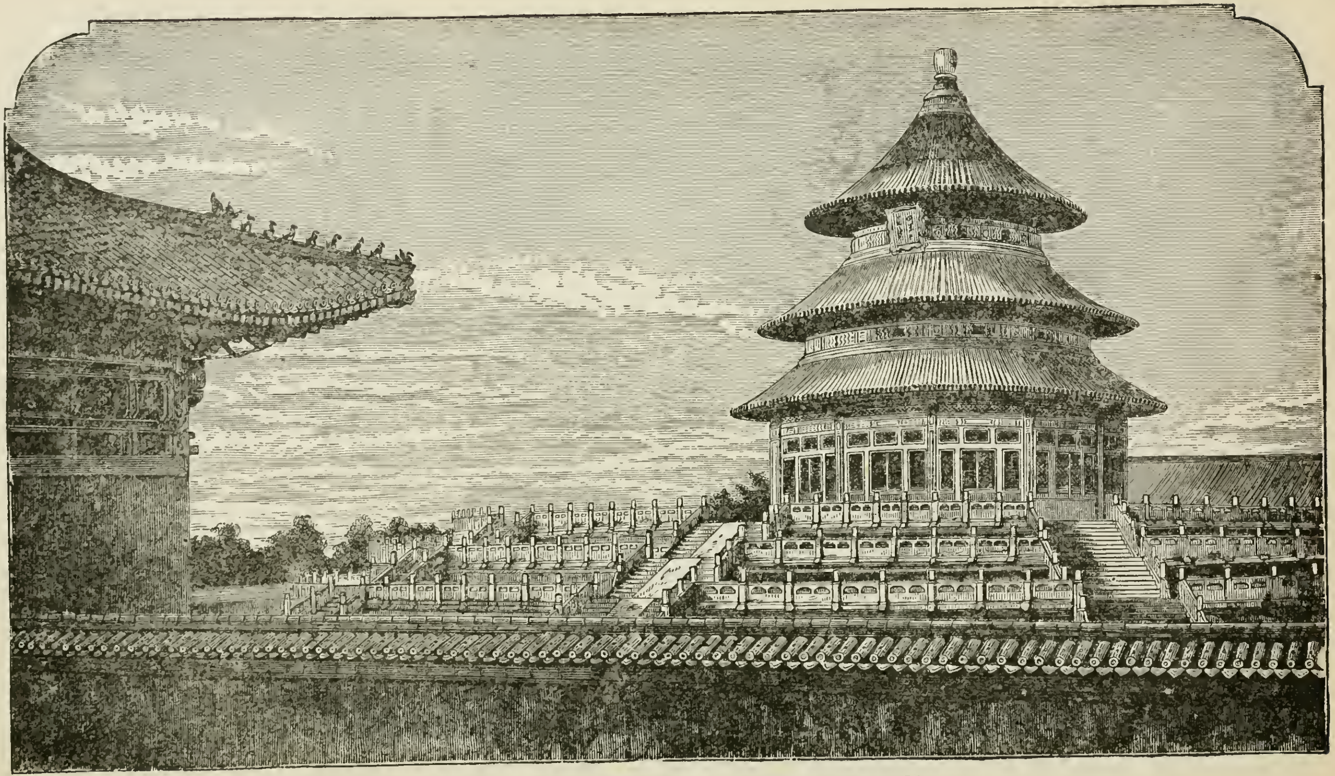
Parents are very particular as to their choice of a schoolmaster, who must be considered good, as well as able to teach; and to qualify himself the master must, of course, know the doctrines of the ancient sages. After all has been settled for a boy to go to school, the parents always invite the schoolmaster to a dinner, given expressly for him. Then a fortune-teller is asked to decide upon a "lucky" day for the boy to make his first appearance at school, when he takes the tutor a present. No boy ever goes to school first on the anniversary of the day on which Confucius died or was buried. On entering school, he turns to the shrine of Confucius—an altar erected to his honor in every school—and worships him, after which he salutes his teacher very respectfully, hears what he has to do, and goes to his desk.

At the new year and in the autumn there are always holidays, but children also go home to keep all religious festivals, to celebrate the birthdays of parents and grandparents, to worship their tablets, and at the tombs of ancestors. Children are very much punished in China when they break school-rules. Perhaps the punishment they fear most is to be beaten with a broom, because they think this may make them unlucky for the rest of their lives.

ELEGANT ARCHITECTURE.

The architecture of China, as would naturally be supposed, is of a light order, and suited to a warm climate. Many buildings are highly ornamented, and abound with elegant carvings. Great care and pains are bestowed on some of the temples, which are considered very beautiful and imposing.

Some houses are very large, in order to accommodate several branches of the same family, who often live together in different parts of them. There are generally three doors of entrance to a house, of which the principal, in the centre, leads to the reception hall, into which visitors are shown. The walls of rooms are sometimes hung with white silk or satin, on which sentences of good advice are written. All sorts of beautiful lanterns hang from the sitting-room ceilings, sometimes by silk cords. The furniture consists principally of chairs, tables, pretty screens and cabinets, with many porcelain ornaments,

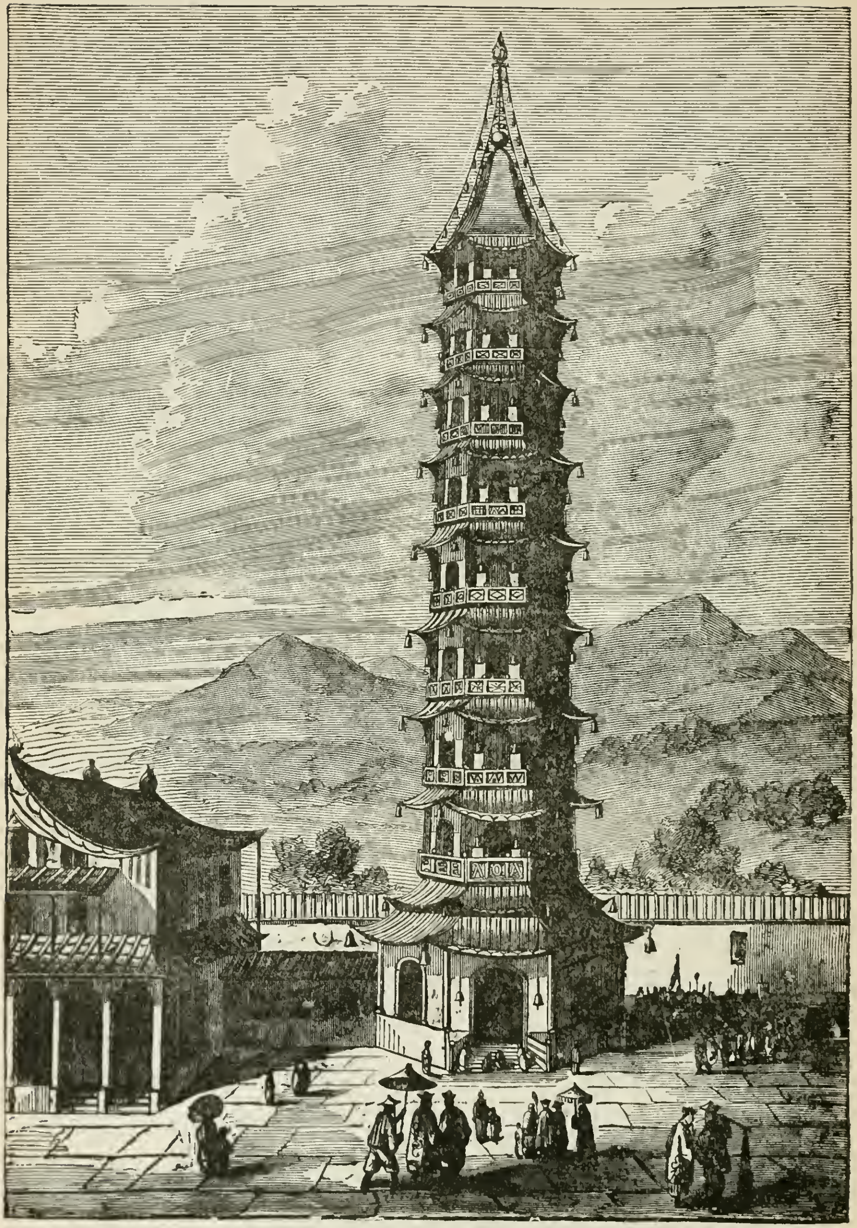


THE TEMPLE OF HEAVEN—PEKIN, CHINA.

and fans are very numerous in a Chinese household. Most houses have very beautiful gardens; even the poor try to have their houses surrounded by as much ground as possible. Many houses also have verandas, where the Chinaman likes to smoke his evening pipe. The custom-house at Shanghai is a very strange and beautiful building, unlike anything to be seen elsewhere, and the town is adorned with many fine residences. At some cities and towns, on the banks of rivers, floating hotels are to be seen; and as people generally have to travel by water, and the Chinese are not allowed to keep open their city-gates after nine o'clock at night, these hotels prove very useful to those arriving too late to enter the city. Lighted with lanterns, they look very pretty floating on the water, and are generally airy and cool.

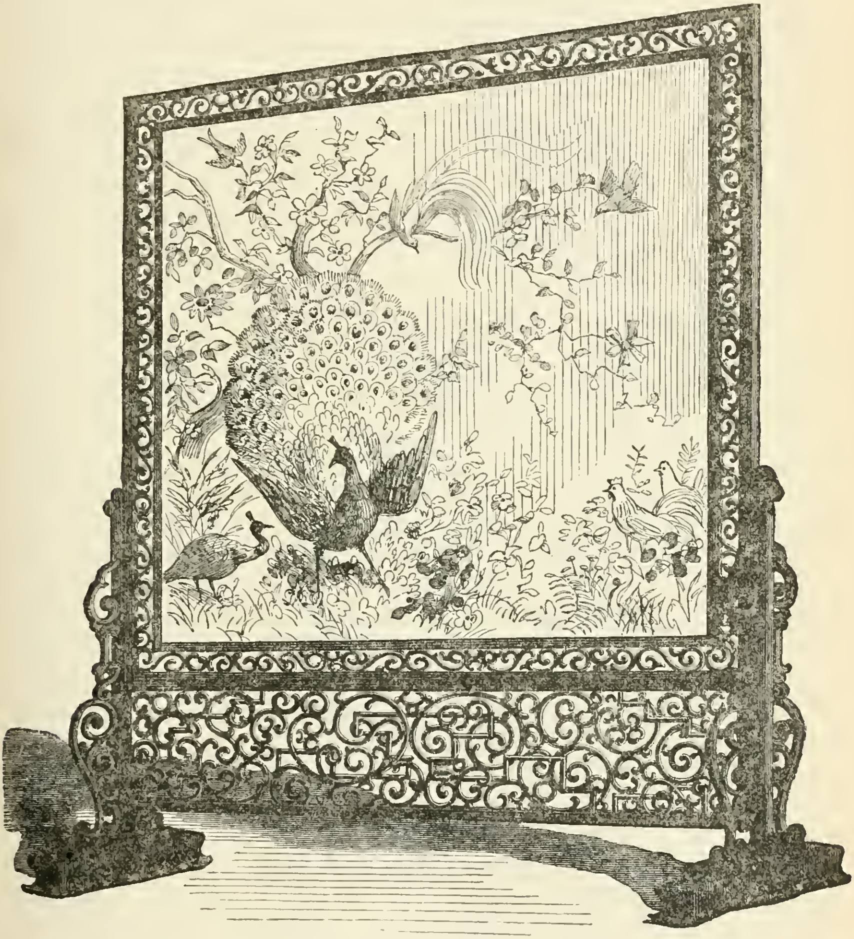
A FAR FAMED TOWER.

The city of Nankin, once the capital of China, has for centuries been famous to the "barbarians" of the outer world for its Porcelain Tower —a relic of the splendor of its ancient days, before Pekin usurped its dignity as the seat of empire. The place is now to a great extent a city of ruins; its palaces, tombs and monuments were long since given over to decay, and the wars of recent years have greatly increased the general dilapidation. The city proper has shrunk to one-fourth of its former dimensions, the present population inhabiting its inner portion, while the memorials of past magnificence are distributed around them. The Porcelain Tower was built early in the fifteenth century by the order of the Emperor Yung-loh, and as a work of filial piety. It was a monument to the memory of his mother; and he determined that its beauty should as far outshine that of any similar memorial, as the transcendent virtues of the parent, in her son's eyes, surpassed those of the rest of her sex. No expense was spared in its erection. The work was commenced at noon on a certain day in 1413, and occupied nearly twenty years in its completion. An idea of the appearance of the Porcelain Tower is given by our description, but this is peculiarly one of the instances in which the actual sight is required to convey an adequate notion of the magnificence and beauty of an object. The total height of the tower was more than two hundred feet, and it was faced from top to bottom with the finest porcelain, glazed and colored. It consisted of nine stories, surmounted by a spire, on the summit of which was a ball of brass, richly gilt. From this ball, eight iron chains extended to as many projecting points of the roof, and from each chain was suspended a bell, which hung over the face of the tower. The same arrangement was carried out in every story. These bells added much to the graceful appearance of the tower, breaking its otherwise formal and monotonous outline. Round the outer face of each story were



THE WONDERFUL PORCELAIN TOWER.

several apertures for lanterns, and when these were all illuminated, we are told, in the magniloquent language of the Chinese historian, that "their light illuminated the entire heavens, shining into the hearts of men, and eternally removing human misery." It is not difficult to imagine, however, that the appearance of the tower on such an occasion



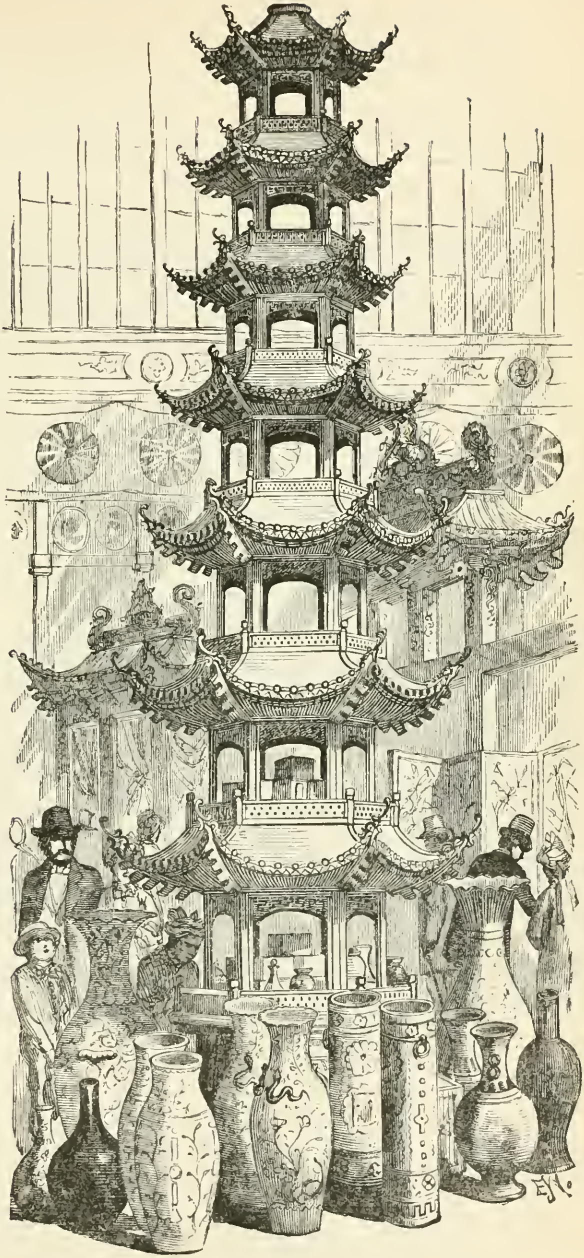
EMBROIDERED CHINESE SCREEN.

must have been beautiful in the extreme. On the top of the tower were placed two large brazen vessels and a bowl, which together contained various costly articles, in the nature of an offering, and a charm to avert evil influences. Among these were several pearls of various colors, each supposed to possess miraculous properties, together with other precious stones, and a quantity of gold and silver. In this collection, designed to represent the best treasures of the state, were also placed a box of tea, some pieces of silk, and copies of some ancient Chinese writings. The Chinese historian to whom we have alluded, announced to the world, in the simplicity of his heart, that this splendid monument of filial gratitude would continue to endure and teach its lesson for hundreds of generations. But alas! for human foresight, and the stability of all things on earth. In the month of March, 1853, the Taeping rebels took Nankin, and sacked the place. For a long time they appear to have kept their destroying hands off the Porcelain Tower; but at last—probably to wreak full vengeance on the Imperialists—they demolished it. This occurred in 1856. Since that time, Nankin has been taken and retaken, both by Imperialists and rebels, but the city is no longer adorned with that famous structure which was truly one of the wonders of the world.

FINE FANCY WORK.

In all works of art the Chinese excel, having a style peculiar to themselves. Their porcelain, or "China ware," is famed throughout the world, and no better material of this description was ever manufactured. The Chinese tea sets and vases are transported in large quantities and find a ready market among other nations. Great skill in embroidery is also displayed, the coloring and design being especially admired. All kinds of figures, particularly those of birds, are used in fancy work, and also in the manufacture of porcelain. Chinese screens may be seen, with costly material of groundwork, and having rich designs representing the peacock, the bird of Paradise, domestic fowls, and other members of the feathered tribes. These are not found alone in the houses of the better class; but, as the Chinese are very expert with the needle, some very fine specimens of embroidery may be seen in the cottages of the poorer people, who seem to take great delight in this kind of decoration. Rich colors are blended with beauty of design, the general effect is studied, and thus exquisite pictures are produced, the product of the needle and the brush.

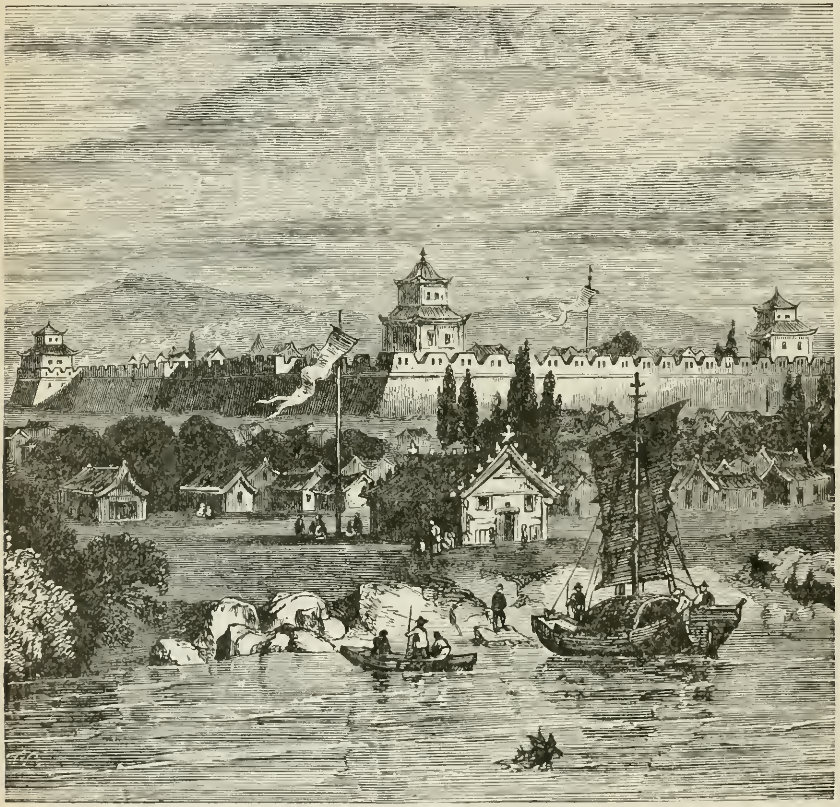
Raising tea has long been one of the principal industries of China. The tea-plant yields a crop after it has been planted three years, and there are three gatherings during the year: one in the middle of April, the second at Midsummer, and the third in September. The plant requires very careful plucking, only one leaf being allowed to be gathered at a time; and then a tree must never be plucked too bare. Women and children, who are generally, though not always, the tea gatherers, are obliged to wash their hands before they begin their work, and have to understand that it is the medium-sized leaves which they are to pick, leaving the larger ones to gather the dew. When the



CHINESE VASES.

baskets are full, into which the leaves have been dropped, they are carried away hanging to a bamboo slung across the shoulders, which is a very usual way of carrying things in China. The tea-plant is the most important vegetable production of the "Flowery Land." There are several kinds of tea, that called Congou being prepared as follows: The leaves are first spread out in the air to dry, after which they are trodden by laborers, so that any moisture remaining in them, after they have been exposed to the air or sun, may be pressed out; after this they are again heaped together, and covered for the night with cloths. In this state they remain all night, when a strange thing happens to them, spontaneous heating changing the green leaves to black or brown. They are now much more fragrant and the taste has changed.

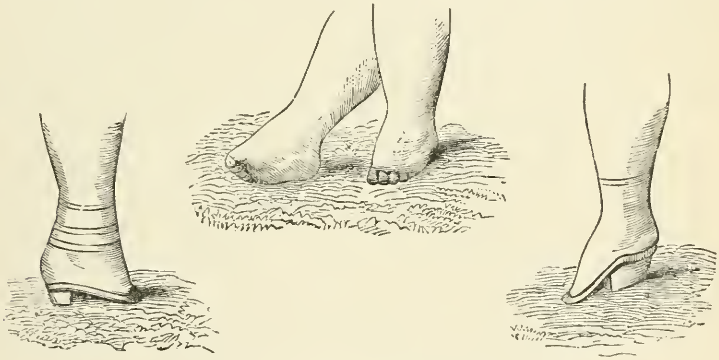
As the tea must now be carefully made ready for the market, the next process is to twist and crumple the leaves, by rubbing them between the palms of the hands. In this crumpled state they are again put in the sun, or if the day be wet, or the sky threatening, they are baked over a charcoal fire. Leaves, arranged in a sieve, are placed in the middle of a basket-frame, over a grate in which are hot embers of charcoal. After some one has so stirred the leaves that they have all become heated alike, they are ready to be sold to proprietors of tea-hongs in the towns, when the proprietor has the leaves again put over the fire and sifted. After this, women and girls separate all the bad leaves and stems from the good ones; sitting, in order to do so, with baskets of leaves before them, and very carefully picking out with both their hands all the bad leaves and stems that the sieve has not got rid of. The light and useless leaves are then divided from those that are heavy and good, when the good are put into boxes lined with paper.



VIEW OF TIEN-TSIN, ONE OF THE TEA MARKETS.

Those leaves which are prepared at Canton are black or brown, with a slight tinge of yellow or green. The tea-leaves growing on an extensive range of hills in the district of Hokshan are often forwarded to Canton, whence they are exported. This, with the trade from other markets, forms an important part of the commerce of the world.

Chinese women have always been celebrated for their diminutive feet. This was long regarded as a national peculiarity, asserted to be of natural growth, and has thus been a wonder in the books of travelers; but by our less restricted intercourse with China the secret has been let out. There were certain small-footed ladies at Hong-Kong who gained a very fair livelihood by exhibiting their feet to sea-captains, and other curious Europeans, at a dollar a head, and the evidence satisfied a superficial examination and belief. But it appears that in the missionary schools may be seen numbers of little girls whose feet are in the various stages of torture, as narrated by a visitor who had the opportunity of witnessing what he has well described. On an appointed day the children were all seated in a row, and their feet, which had undergone a preparatory washing, were unbound by their mothers. The first was a child two years old. Her penance had but just commenced. When the bandage of blue cotton was taken off it was seen that the great toe had been left untouched, but the other four had been forced down under the ball of the foot, and closely bound in that position. The child, therefore, walked upon the knuckle-joints of her four toes. The toes were red and inflamed, and the ligature caused evident pain. In the next three children, of ages advancing at small intervals, the preparation was only to the same extent; it was confined to the four toes. Gradually, however, these four toes, according to the continual pressure, lost their articulation and identity as limbs, and became amalgamated with the sole of the foot. In the eldest of the four the redness and inflammation



DEFORMED FEET OF CHINESE LADIES.

had entirely disappeared; the foot was cool and painless, and appeared as though the four toes had been cut off by a knife. The foot was somewhat of the shape of a trowel.

In the fifth girl was seen the commencement of the second operation —a torture under which sickly children frequently die. The sole of the foot was now curved into the shape of a bow: the great toe and the heel being brought together as near as possible. This is done very gradually. The bandage is never slackened; month by month it is drawn tighter. The foot inflames and swells, but the mother perseveres. As the bones and tendons accommodate themselves to the position constrained by the bandage, so it is drawn tighter. At last the ball of the natural foot fits into the hollow of the sole, and the root of the great toe is brought into contact with the heel. The foot is a shapeless lump. The instep is where the ankle was, and all that is left to go into the slipper and to tread the ground is the ball of the great toe and the heel. This is the small foot of the Chinese woman; a bit of toe and a bit of heel, with a mark like a cicatrice left after a huge cut, running up between them. Two of the girls seen by the narrator were yet suffering great pain, and their feet were hot and inflamed, but in the eldest the operation was complete. She had attained to the position of a small-footed woman, and her feet were quite cool, had no corns, and were not tender to the touch. One of the mothers solved the mystery. Sometimes, it seems, when a woman is expected to have to do hard work, her toe and heel are not drawn together so as to produce the true "small foot." To disguise this imperfection upon her marriage day she has recourse to art. A piece of cork, shaped like an inverted sugarloaf, is strapped on to her foot, and the small part goes into her slipper, and passes for her foot.

HONORS PAID TO GENERAL GRANT.

Some of the social customs of the Chinese may be learned from a description of a grand dinner given in honor of General Grant during his tour round the world. The narrator says: I tried to pay my hosts the compliment of using the chop-sticks. They are about the size of large knitting needles, and, in the hands of a Chinaman, useful instruments. The servants twirled them all over the table, and picked up every variety of food with sure dexterity. I could do nothing with them. I never thought I had so large fingers as when I tried to carry a sweetmeat from one dish to another with chopsticks. The food was all sweetmeats, candied fruit, walnuts, almonds, ginger, cocoanuts, with cups of tea and wine. The Viceroy, with his chopsticks, helped the General. This is true Chinese courtesy for the host to make himself the servant of his guest. Then came a service of wine—sweet champagne and sauterne—in which the Viceroy pledged us all, bowing to each guest as he drank. Then, again, came tea, which, in China, is the signal for departure, an intimation that your visit is over. The Viceroy and party arose and led us to our chairs. Each one of us was severally and especially saluted as we entered our chairs, and, as we filed off under the trees, our coolies dangling us on their shoulders, we left the Viceroy and his whole court, with rows of mandarins and far-extending lines of soldiers in an attitude of devotion, hands held together toward the forehead and heads bent, the soldiers with arms presented. The music, real, banging, gong-thumping, Chinese music, broke out, twenty-one guns were fired, so close to us that the smoke obscured the view, and we plunged into the sea of life through which we had floated, and back again, through one of the most wonderful sights I have ever seen—back to our shady home in the American Consulate.

The call of the Chinese officials the next day was a solemn ceremony. The Viceroy sent word that he would come at ten. Punctuality, however, is not an Oriental virtue, and ten o'clock had passed and we were sitting on the piazza looking out on the shipping in the river, when the beating of gongs gave the signal of the coming in state.

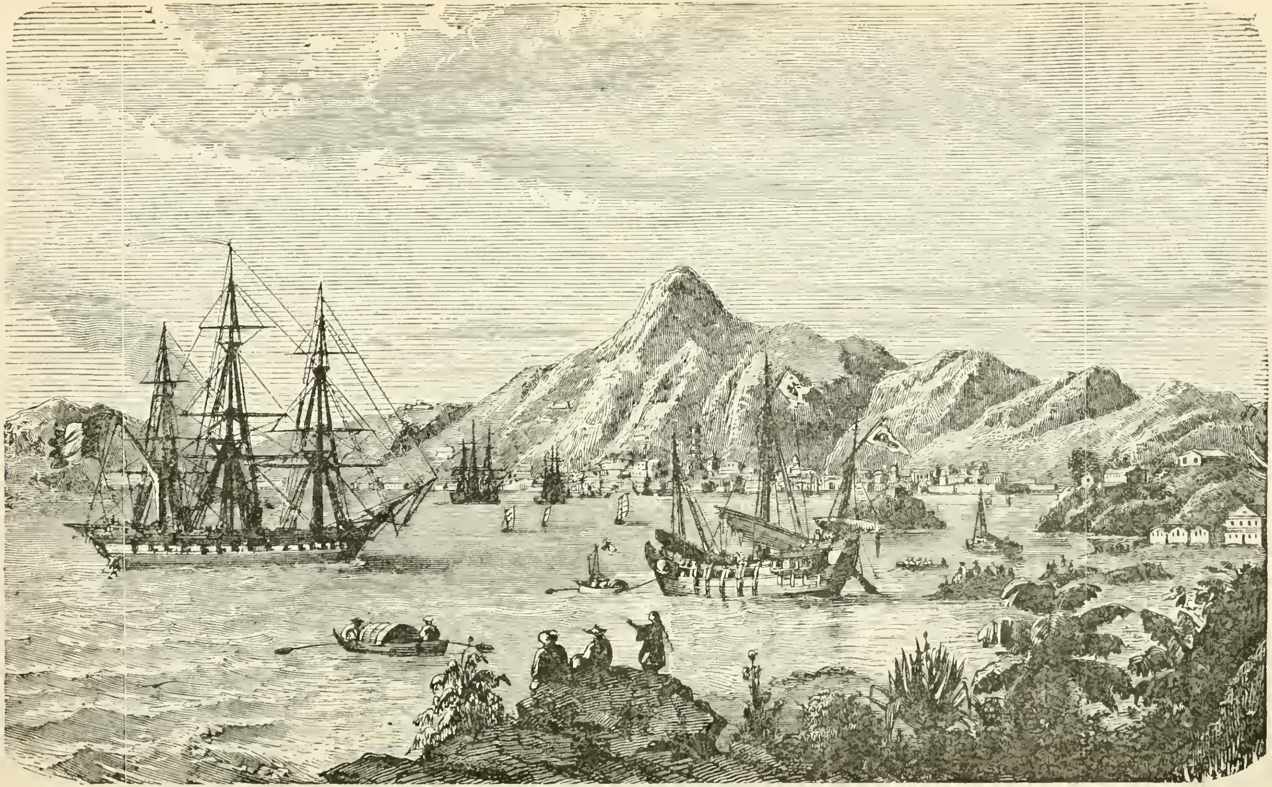
VISIT FROM A POMPOUS OFFICIAL.

I went out under the trees to see the procession, at the risk of exciting remark as to my curiosity from the crowd of Chinamen, chair-bearers, attendants and others who were standing around waiting for the show. The visitor proved to be the Tartar General, and he came in the most solemn state. First came the gong-beaters, who beat a certain number of strokes in a rapid measure. By the number you know the rank of the great man. Then came soldiers carrying banners on which were inscribed the names and titles of the commander. There was a marshal on a pony who seemed to command the escort. There were soldiers carrying spikes and spears and banners. The profusion of banners, or more properly small silk pennants, gave the procession a picturesque aspect, and the waving, straggling line, as it came shambling along under the trees, was quaint. There were attendants carrying the pipes and teapots of the great man. Four coolies carried a load under which they staggered, and this, I was told, was food. It is the custom when a great man goes forth to carry food and refreshment for himself and party and to give as largess to friends on the way, and although this General was only making a morning call, he showed honor to our party by coming in as much state as though he were journeying through the country. There were aids in chairs, but the General rode in a green state chair, the blinds closely drawn. I noticed that there was no drill or discipline in the procession—no keeping step. It shuffled and straggled along, the gongs beating and the attendants shouting in chorus to clear the way and do honor to the great man they were escorting until the Consulate was reached. Then the soldiers and burden-bearers crowded under the trees and the Tartar General's chair was borne to the piazza, and he at once alighted.

THE CONVERSATION AND REFRESHMENTS.

The Tartar General, Chang Tsein, was met at the door by the Consul and escorted into the parlor, where General Grant shook hands and gave him a seat. The attendants swarmed around the doors and the windows. I rather pitied the Tartar General, who looked tired and nervous, when I was told that his hour for rising was three o'clock in the afternoon; that he was not in the best of health, and that nothing but his desire to be civil to General Grant induced him to break through his habits. But His Excellency was chatty and ran into a long conversation, mainly about the age of General Grant and his own, the long distance between America and China, the extraordinary fact that the world was round, which no Chinaman really believes, and the singular circumstance that while we were sitting there looking at the trees and the shining sun, people at home were either in bed or thinking of going to bed. One of the party, for the purpose, I presume, of sustaining the conversation, said that in going around the world we lost a day—that it was 364 days in the year going one way, and 366 going another; to all of which the Tartar General listened with a polite but doubting interest. General Grant ventured upon some questions as to the resources of the country, and learned that Pekin was much colder than Canton, that the Tartar General's home was in Pekin, that he had been so long in Canton, that his health was affected and he wanted to be recalled. This talk ran on for fifteen minutes and tea was passed around in Chinese fashion, and the Consul led the way to another room. Here were refreshments, mainly sweetmeats and wine. Ten minutes more were spent over the candies and cakes, and the Tartar General, filling his glass with champagne, drank our health. Then tea was served again and the Tartar General arose, took his leave, and went off amid the beating of gongs, the waving of banners and the cries of his retinue. In this, as in other grand ceremonies and customs of the Chinese, noise was an essential feature.

The sounds of the gongs had scarcely died away when the sounds of other gongs announced the coming of the Viceroy, Lin Kwan Yu. He came in a little more state than the Tartar General, but the ceremonies of the reception were about the same. Then came other officials, all of whom had to be received, and given tea and sweatmeats and wine, so that the morning had gone before the last visit.



TOWN AND HARBOR OF VICTORIA, HONG KONG.

From the narrative of a traveler who closely observed the social customs of the Chinese, it appears that a wedding is attended with some very curious ceremonies, as will be seen from the description. The bridegroom sent very early in the morning for his bride. The bridal-chair was painted red. Before the bride took her seat in the sedan, which was brought into the reception-room of her home for her, she having eaten nothing that morning, and having "kowtowed" very often to her parents, they covered her head and face with a thick veil, so that she could not be seen. The floor, from her room to the sedan, was covered with red carpet. When in the sedan, four bread-cakes were tossed into the air by one of the bridesmaids as an omen of good fortune. In front of the procession two men carried large lighted lanterns, having the family name of the bridegroom, cut in red paper, and pasted on them. Then came two men bearing the family name of the bride, who were, however, only to go part of the way. Other men followed, some carrying a large red umbrella, others torches, and again some playing a band of music. Near the bridal chair brothers or friends of the bride walked. Half-way between the two houses the friends of the bridegroom met the bride, and as they approached the procession stopped.

A BRIDAL PARTY WITH LIVELY MUSIC.

The bride's friends brought out a large red card, on which was written the bride's family name, and the other party produced a similar one, bearing that of the bridegroom. These were exchanged with bows. The two men at the head of the procession then walked, with their lanterns, between the sedan-chair and the lantern-bearers, who carried the bride's family name, and returned to their places in front, when the bride's party turned round and went back to her father's house, carrying home her family name, she being supposed to have now taken that of her husband. Even her brothers went back also, and then the band played a very lively air whilst the rest of the procession took her on. Fireworks were let off along the road, and a great many outside the bridegroom's door when the bride arrived. Her bridesmaids, who have to keep with her throughout the day, accompanied the procession. As the sedan-chair was taken into the reception-room the torch-bearers and musicians stayed near the door, and where it was put down the floor was again covered with red carpet. The bridegroom then came and knocked at the bridal door, but a married woman and a little boy, holding a mirror, asked the bride to get out. Her bridesmaids helped her to alight. The mirror was supposed to ward off evil influences.

Sometimes, much for the same purpose, a bride is carried over a charcoal fire on a servant's back, but this was not done on this occasion.

All this time the bride's face was hidden by her veil. She was then taken into a room, where the bridegroom was waiting for her, and here they sat down together for a few minutes, without speaking a word. Sometimes the bridegroom sits on a high stool, while the bride throws herself down before him, to show that she considers man superior to woman. He then went into the reception-room, where he waited for his bride to come to worship his ancestral tablets with him. A table was put in front of the room, on which were two lighted candles and lighted incense. Two goblets, chop-sticks, and other things were on the table, when the bride and bridegroom both knelt four times, bowing their heads towards the earth. This was called "worshiping heaven and earth." The ancestral tablets were on the tables at the back, on which were also lighted candles and incense. Turning round towards the tablets, they worshiped them eight times, and then facing one another, they knelt four times.

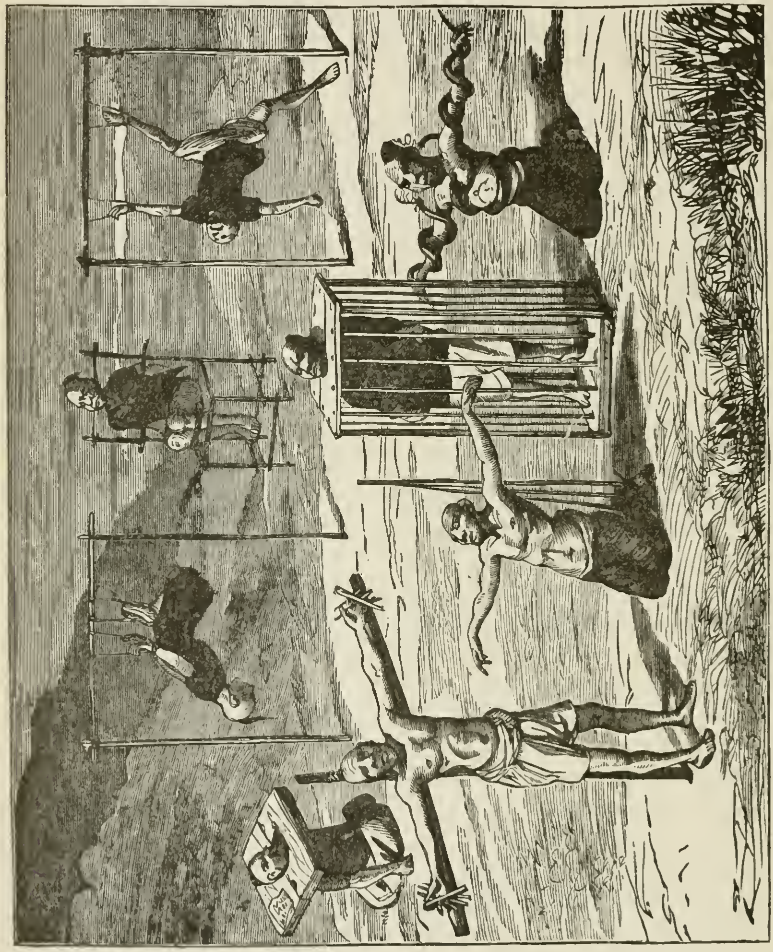
THE BRIDEGROOM'S FIRST SIGHT OF HIS BRIDE'S FACE.

Wedding wine was now drunk, and the bride and bridegroom ate a small piece from the same sugar-cock, which was to make them agree. The thick veil was now taken off the bride, but her face was still partly hidden by strings of pearl hanging from a bridal coronet. It often happens that the bridegroom now sees his bride for the first time, the two fathers having perhaps planned the marriage, asked a fortune-teller's advice, sent go-betweens to make all the necessary arrangements, chosen a lucky day, without the bride or bridegroom having a voice in the matter, and conducted all the negotiations.

Many other ceremonies had to take place, such as kneeling very often before the bridegroom's parents, when at last it was time for the bride's heavy outer garments to be taken off, together with her head-dress, so that her hair could be well arranged; but she was not allowed to eat anything at all at the wedding dinner. Indeed, on her wedding-day, she is hardly expected to touch food at all.

Many people came in to see her, and on this day she must be quite natural, and wear no rouge at all. She has to stand up quietly to be looked at, blessed, and have remarks made upon her appearance. Presents are sent to the bridegroom's family. For three days the bride's parents send her food, as she may not, during that time, eat what her husband provides. In some districts of the province of Canton the bride leaves her husband, and goes home again for a time after she is married, but after marriage she is generally considered to belong almost entirely to her husband's family, in a wing of whose house she lives with him, and to whose parents she is supposed to help him to be filial. On many other days the ancestral tablets have to be worshiped by the bride and bridegroom, and amongst other gods and goddesses, those of the kitchen have adoration paid to them with becoming gravity. Both boys and girls in China sometimes marry when they are only sixteen years of age, thus making an early start in life.

It is customary for terrible tortures to be inflicted upon criminals. The most common punishment of criminals in China is that of the cangue, a sort of moveable pillory. A piece of wood, some four feet square and nearly four inches in thickness, has a hole in the middle, through which the culprit's head is passed. The machine opens with a hinge, and when closed is locked, and a placard designating the offense is pasted on it. As long as the cangue is worn, the unhappy



CHINESE MODES OF TORTURE.

delinquent cannot feed himself, so that he would be starved to death were he not fed by casual contributions. Fortunately, it is considered a meritorious action to feed a prisoner in the cangue, so that little risk of actual starvation is run, and the principal terror of the cangue lies in the pain caused by carrying such a weight upon the neck and shoulders. This instrument is often worn for weeks and sometimes for three months, which is the extent of its legal use.

Finger squeezing is another torture which is frequently used. Four pieces of bamboo are tied loosely together at the end, and a string passes through the other ends, so arranged that by drawing it they can be pulled closely together. The fingers are introduced between the bamboos, and by pulling at the string they can be crushed almost to pieces. This torture is often employed by the mandarins, when endeavoring to extort money from persons whom they suspect of concealing their wealth. The ankles are squeezed after a similar fashion, only in this case the bamboos are much larger.

Most of the so-called minor tortures, that is, those which are not directly aimed at life, are employed for the purpose of extorting money, which seems to be a customary procedure among landlords. Beating with the bamboo is another common punishment. There are two kinds of bamboo for this purpose, the small and the large; the latter being capable of producing death if used with severity. This punishment is employed for men and women alike; the only difference being that the man is thrown prostrate on the ground, while the woman suffers in a kneeling posture.

HIRING A SUBSTITUTE TO TAKE THE WHIPPING.

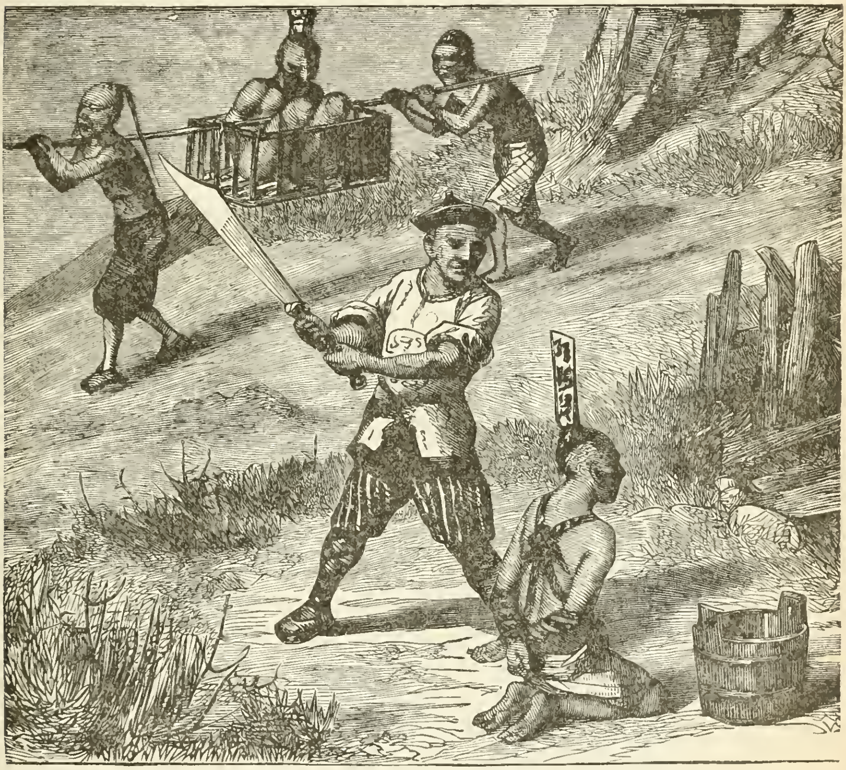
A man of forethought, however, never suffers much from the bamboo, and, if possible, nothing at all. In the former case, he bribes the executioner, who strikes so as to produce a very effective sounding blow, but in reality inflicts very little injury. In the latter case, he bribes a man to act as a substitute, and, just as the first blow is about to be struck, some of the officers, who are also bribed, get between the judge and the culprit, while the latter rolls out of the way, and the substitute takes his place. A similar ruse is enacted at the completion of the punishment. It may seem strange that any one should act as a substitute in such a business; but in China men care little for their skins, or even for their lives, and it is possible to purchase a substitute even for capital punishment, the chief difficulty being not to bribe the substitute, but to find enough money to bribe all the officials, who must act in concert, and each receive his handsome fee.

Powerful as they may be, the mandarins have not all the power of life and death, though they can inflict punishments which practically lead to the same result. A case of this kind is narrated. Two men had been arrested in the act of robbing a house during a fire. This is rightly held to be the most heinous kind of theft, and is generally punished with decapitation. The mandarin of the district had not the power to inflict death, but contrived to manage that the men should die. Accordingly, he had two tall bamboo cages made, placed a man inside each, and tied him by his hair to the top bars of the cage. The cages were placed in the open air, in charge of officers, who would not allow any communication with the offenders. The natural consequence was, that privation of food, drink, sleep, and rest of any kind, together with exposure to the elements, killed the men as effectually as the sword of the executioner. A modification of this mode of punishment is by covering the top of the cage with a board through a hole in which the head of the sufferer passes. The top of the cage is adjusted so that the man is forced to stand on tiptoe as he is suspended by the neck. His hands being bound behind him, relief is, of course, impossible. Snake tubes made of soft metal are sometimes coiled round the body, and boiling water is then poured into them, producing the most horrible torture, and sometimes a slow, lingering death.

SINGULAR MODES OF CAPITAL PUNISHMENT.

As to capital punishments, they are inflicted in various ways. The mode that is thought to be the least terrible is the command to commit suicide, because in that case they can avoid the mangling of the body, and so make their appearance in the spirit world whole and entire. This is a privilege only accorded to officers of very high rank, and is conferred upon them by sending the "silken cord." No cord is really sent, but the mandate implies the instrument of death. When it is received, the doomed man takes some of his nearest relatives and most valued friends to his house, fastens the silken cord to a beam, places himself on a stool, passes the noose round his neck, and then leaps off the stool, and so dies. Officers of lower rank, when they see that they will probably be condemned to death, generally anticipate their sentence by hanging themselves on their own responsibility. For criminals of no status, strangulation is the mode of death most preferred. It is accomplished in a manner exactly resembling the Spanish garrote. The criminal stands with his back to a post, through which a hole is bored at the level of his neck. The two ends of a cord are passed through the hole, the loop embracing the man's neck. The ends are then twisted round a stick, and, by a few rapid turns of the stick, the man is killed.

Decapitation is always conducted with much judicial solemnity, and, as a rule, is restricted to certain seasons of the year, when large batches of criminals are executed. There are, however, occasional exceptions to the rule. The instrument employed is a sword made expressly for the purpose. It is a two-handed weapon, very heavy, and with a very broad blade. The executioners pride themselves on their skill in its management, and, in order to show their powers, will draw a black-ink line round a turnip, and sever it at a blow, the cut never passing on either side of the line. Before a man is admitted to be an executioner, he is obliged to prove his ability by this test, and be able to carry a steady hand as he gives the fatal blow.



DECAPITATION OF A CHINESE CRIMINAL.

The criminal is carried to the place of execution in a bamboo cage, and by his side is the basket in which his head will be removed. He is pinioned in a very effective manner. The middle of a long and thin rope is passed across the back of his neck, and the ends are crossed on the chest, and brought under the arms. They are then twisted round the arms, the wrists tied together behind the back, and the ends fastened to the portion of rope upon the neck. A slip of paper containing his name, crime, and sentence is fixed to a reed, and stuck at the back of his head. On arriving at the place of execution, the officials remove the paper, and take it to the presiding mandarin, who writes on it in red ink the warrant for execution. The paper is then replaced, a rope loop is passed over the head of the culprit, and the end given to an assistant, who draws the head forward so as to stretch the neck, while a second assistant holds the body from behind; and in a moment the head is severed from the body.

Chinese people do very singular things. Because they think that their birds sometimes like change of air, they carry their cages out of doors with them for a walk. Dogs are sold in the shops, and in one district of Canton a fair is held, where they are regularly sold for food. Many people like black dogs best. At the beginning of summer nearly everybody eats dog's flesh, when a ceremony takes place. If people eat it, they think it will keep them from being ill. Yet the Cantonese think that they displease the gods when they eat dog's flesh, and you may see it written on Buddhist temples that people ought not to eat "their faithful guardians." The Cantonese must not go into a temple to worship till they have been three whole days without eating any dog. Thus a little respect is shown to the brute creation.

THE MAN WHO MAKES THE FASHIONS.

Chinese gentlemen and ladies dress very much alike; and people cannot change their clothes as they choose, because there is a minister of ceremonies, who says of what color, stuff, and shape things are to be made, and when winter and summer things are to be changed. Even a head-dress may not be altered as people like, or they might be breaking a law. No Chinaman wears a beard till he is forty. The outside robe of a gentleman is so long that it reaches to his ankles, and it is fastened with buttons. The sleeves are first broad, and then get narrower and narrower. A sash is tied round his waist, and from this chop-sticks, a tobacco-case, fans, and such-like things hang. The head-dress is a cap with a peak at the top. Men do not take off their hats to bow; indeed, they would put them on if they were off. Indoors they wear silk slippers, pointed and turned up at the toes. Chinese men are admired when they are stout, and women when they are thin. Women also have two robes, the top one often being made of satin, and reaching from the chin to the ground. Their sleeves are so long that they do instead of gloves. They always wear trousers, and often carry a pipe, as women smoke a great deal in China. Old ladies wear very plain clothes. People wear shoes of silk, or cotton, with thick felt soles. The women spend hours having their hair done into all sorts of shapes, such as baskets, bird-cages, or anything they can manufacture. Then besides ornaments in their hair, they wear earrings and bangles. Even boat-women wear these ; and the ladies almost always paint their faces, to do which they have a kind of enamel. Chinese ladies have little useful occupation, and spend a great part of their time, when they are not doing embroidery, in gambling and adorning themselves.

The peasants wear a coarse linen shirt, covered by a cotton tunic, with thin trousers fastened to the ankles. In wet and cold weather they make a useful covering of net-work, into which are plaited rushes, or coarse dry grass, and they put on very large hats, made in the same way. The Chinese are not at all lazy people. After their shutters are closed, and all looks dark from the outside, they are often at work, and they get up early too. Coolies wear their hair twisted around their heads. They do all the heavy work, and are porters, common house laborers, and sedan-chair bearers.

You may see men carrying baskets, in which they are collecting every bit of paper they can find about the streets, which has been written upon. The Chinese have such respect for every little piece of paper, on which have been any Chinese characters, that they will not allow any parcels even to be wrapped up in them. When all these scraps have been collected, they are burnt in a furnace, and the ashes are put into baskets, carried in procession, and emptied into a stream. Slips of paper are pasted on walls, telling people to reverence lettered paper. Chinese characters are called "eyes of the sage ;" and some people think that if they are irreverent to the paper, they are so to the sages who invented them, and they will perhaps, for a punishment, be born blind in the next world. Men become famous in China when they write very beautifully. They write with a brush and India ink. There are three styles of writing Chinese characters, and the literature of China is the first in Asia. A Chinaman writes from right to left, and all the writing consists of signs or characters. One word will signify a number of things, and you know which word they mean by the sound of the voice and the stress on the word.

When a person dies gongs are beaten, and when the body is placed in its coffin, every corner of the room is beaten with a hammer, to frighten away bad spirits. A crown is also put on any person of rank. Widows and children, to show their grief, sit on the floor instead of on chairs for seven days, and sleep on mats near to the husband and father's coffin. On the seventh day letters are written to friends, informing them of the death, when they send presents of money to help to defray the funeral expenses.

CHAPTER VIII.

WONDERS OF JAPAN.

Personal Appearance of the Japanese—Fruits and Food—Theatrical Plays and Jugglery—Shops and Markets—Fortune Telling—Art—Social Customs—Dinner to General Grant—Musicians—Royal Reception and Court Manners—Potteries—Modes of Traveling—Forms of Religion—Shintoism and Buddhism.

THE Japanese are a people quite separate from the Chinese, although in certain general features there is, between the two nations, a resemblance, easily traced. The complexion of the inhabitants of Japan varies from copper color to the olive-brown of Italians and Spaniards, but is far from being the same as the yellow of the Chinese. The Japanese have thick black hair and beards—at least would have if they would let them grow. Some do let the hair grow in an unparted mass, but most shave and arrange it carefully, according to custom.

The reason for shaving the hair from the temples and the front of the head, and gathering all the rest into a top-knot, is because, in the feudal times, it became a custom for warriors to do this, that they might keep the hair out of their eyes when fighting. Gradually the custom spread to all classes. But in more ancient times still, the warriors were long-haired, bearded and moustached, and wore a kind of armor. The complexions of children are often brilliant and rosy, like those that accompany dark hair and eyes among ourselves; while those of ladies of the upper-classes, who go out but seldom and guard carefully against sun and wind, are very fine, white, and delicate, but almost colorless. The people generally have expressive and animated faces, the children are pretty and engaging, and every one confesses that Japanese girls are very charming in their way.

Two kind of faces are to be seen very unlike, although, no doubt, a stranger would at once recognize either as Japanese. The one is seen chiefly among the wealthy and noble classes, especially the female part of them; the other is the commoner type all over Japan, although it is not unfrequently found among nobles.

The high class type of face is long and oval, with a high and narrow forehead, straight or aquiline nose, slanting, deep-set, almond-shaped eyes, small thin-lipped mouth, and pointed chin; this type of face is called "nut-cracker" by the irreverent. The half-shaved crowns of the men give an appearance of undue length and oddity to their countenances, from which the women's frizzed-out rolls of abundant lustrous black hair saves them. Women of this type are really beautiful, and they are, besides, so graceful in their carriage and manners, and so winning, and yet dignified, that even strangers are charmed with them. The voices of all classes are soft, and the manners of all are courteous, and of the higher class very elaborate and stately.

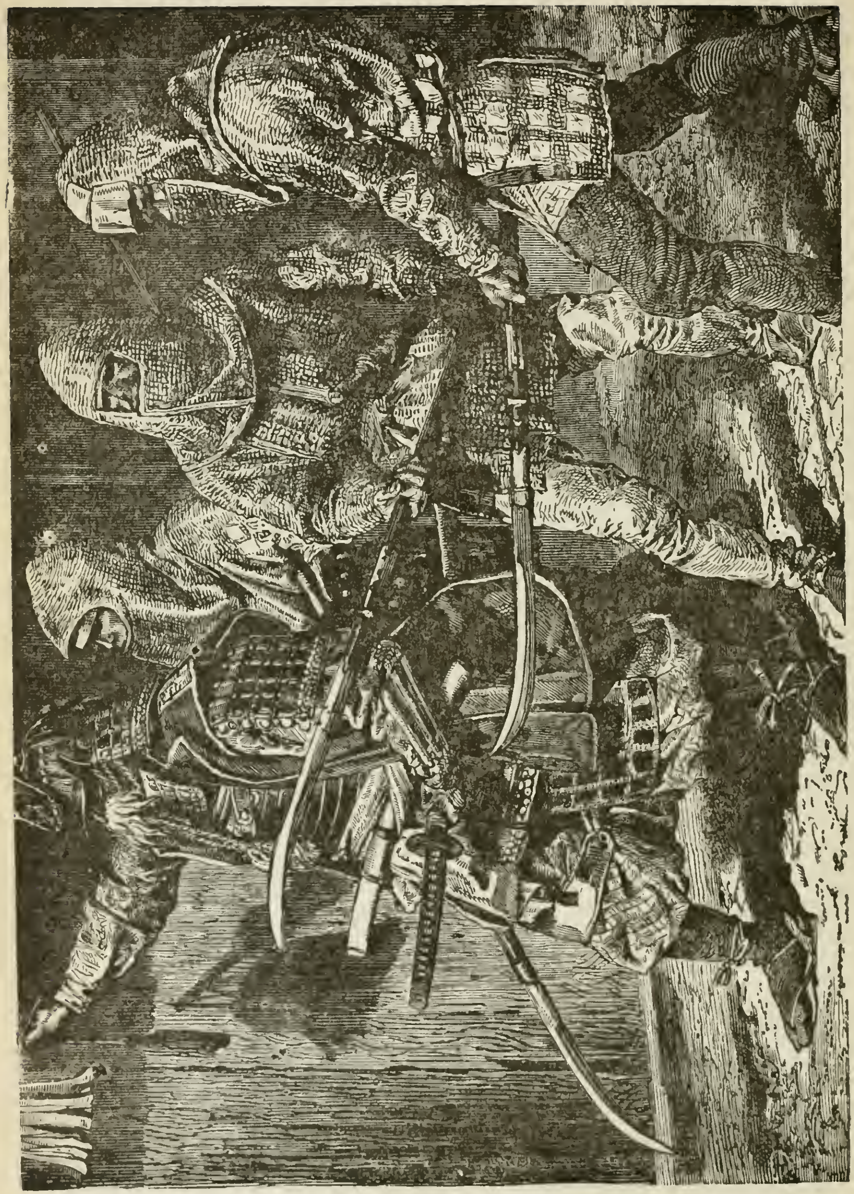
It is supposed that the poor food and laborious life of the mass of the people has something to do with their flatter and coarser features and sallower complexions. They are not unhealthy, but they have little to make them strong and hearty.

There are about ninety different kinds of fish—thirteen or fourteen of them shell-fish—to choose from; fourteen kinds of beans, which more nearly supply the place of meat than anything else; many vegetables, potatoes, spinach, egg-plant, yams, leeks, and others, sea-weed made into jelly, and many roots whose names you never heard of. In some parts of the country grapes, bananas, orange-trees, and sugar-cane grow. A loaf of bread would never cheer your eyes. Sweetmeats, and sponge-cake, and oranges, those who are not too poor can have in abundance. They have the persimmon, a golden fruit much larger than an apple, and more delicious than any when fresh, and when dried by hanging from the kitchen roof tasting something like a fig; but game, fowls, or ducks, hardly ever. Cattle and sheep now are used both for milk and food.

Fish is fish, even if it be only a piece of whalesteak, which sometimes comes to the table after a whale has been unfortunate enough to visit the north-eastern shores. Sometimes stews are made of quail, woodcock, and pheasant by the wives of the tired sportsmen who have snared them; and in the mountains, where monkeys are plentiful, they are trapped and killed and roasted, and are considered a great delicacy; so, by-the-bye, are sea-slugs, and many other things you would shudder at, even to a kind of whitish clay which the poor Ainos make, with boiled lily-bulbs, into soup.

The Japanese do not take such pains to have their food hot as we do. Even in the depth of winter, you will see a porter taking for his breakfast a mass of cold rice, just warmed by pouring tea over it. They use chop-sticks and spoons, for the most part, at meals. The daughter of the house, or the maid, generally dispenses the food, ladling out the rice from a bucket into little bowls, pouring out the tea, and waiting upon all.

Theatres are so important a part of Japanese life that a description of them must be given. The best and most serious people do not care



JAPANESE WARRIORS—OLD STYLE.

to attend the theatres, nor is it the custom for persons of high rank to do so. They attend or join in the private performances given within the palace. Women under forty are forbidden by law to visit the public theatres—but many among the poorer classes, however, disobey the law and attend, with their husbands and families, an amusement which has a peculiar charm for the Japanese. Sometimes juggling and acrobatic performances are given, sometimes plays on legends of heroic or feudal times or on real events. These are very interesting as giving a faithful representation of the good old times, with all their dignity and splendor of ceremonial and dress, and as reminders of the patriotism and great-heartedness of ancestors. The scenery and dresses for these are most elaborate and even magnificent; the latter are often almost priceless, being heir-looms handed down from one generation of actors to another. The actors were once a despised class, and reckoned among the eta or outcasts. They learned the art from their fathers, and passed on its traditions to their sons, thus making the profession hereditary.

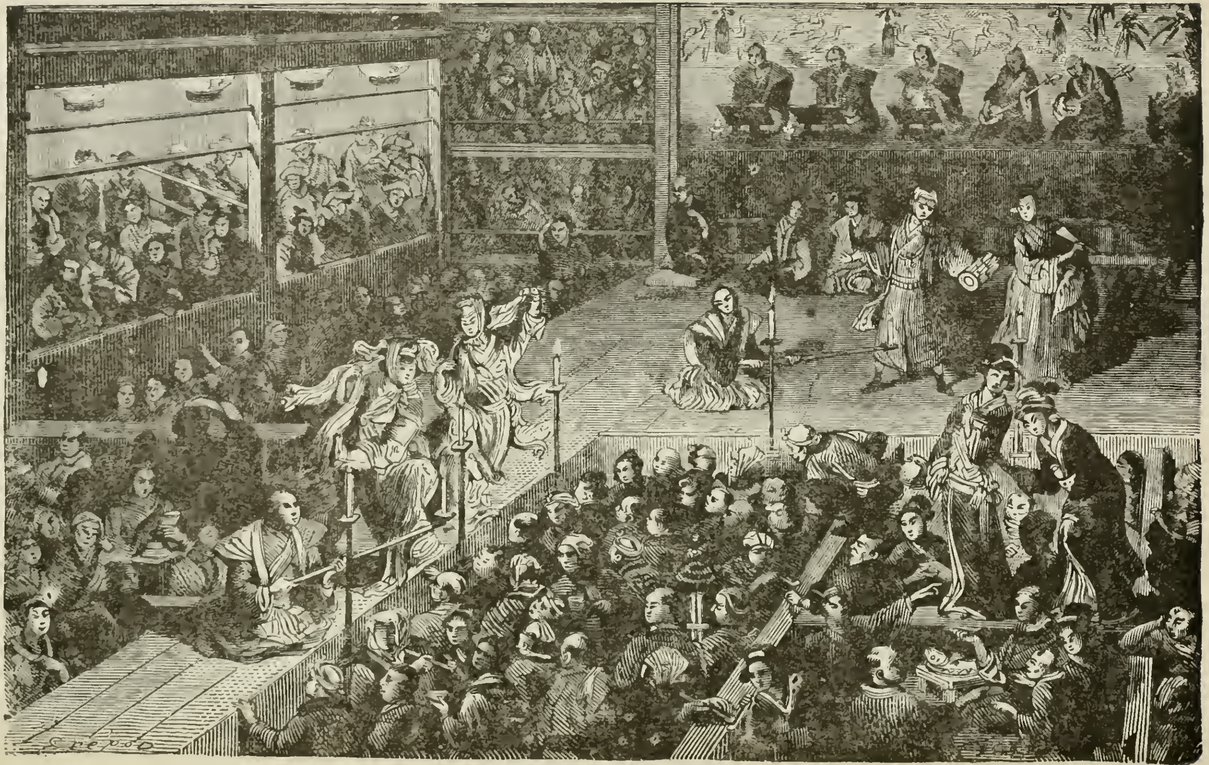
SINGULAR JAPANESE AMUSEMENTS.

Then, again, masques and pageants are given—such as scenes from the old court life, or celebrations of the changing seasons. These are beautiful and instructive, but the tragedies and ordinary plays are neither. Women were not allowed to act in public except in one or two companies, composed of women only. Men act the women's parts cleverly enough, but their imitation of women's voices sounds laughable to strangers, and produces a ludicrous effect.

The play begins about nine or ten in the morning, and lasts all day; sometimes two or three days! Generally it leaves off at dark. When a favorite play is announced, people come early to get good seats—on the floor, of course. Mothers bring their babies, and their husbands the provisions in the dinner-box, and they spend the whole day at the theatre, smoking all the time, chatting and eating when the actors rest. Tea-house servants bring in trays and offer refreshments. Black-capped boys (whom you are supposed not to see) wait on the actors' movements, slipping behind them and taking away the stage furnishings that are done with, or placing supports, unobserved, for a weary actor, so that he may keep his position the due length of time.

If the performance goes on after dark, candles are lit in front of the stage, and, in addition, attendants hold wands with candles at the end of them, so that the light falls on the actors' faces. Next day, if the play is unfinished, the crowds come again and listen unweariedly, and often breathless and silent with excitement, to the long drawn out agonies, raptures, and suspenses of a Japanese play.

The masked dances and pageants are especially delightful, coming



INTERIOR OF A JAPANESE THEATRE.

down, as they do, from very ancient times, when they were associated with religious meanings, and were intended to teach moral lessons.

Women, besides keeping house, work in the fields as hard as the men, and there is scarcely anything that they can do, from leading pack-horses to swimming and diving for shell-fish among the rocks, that they are not employed in. They spin and weave, after they have combed out the fluffy heaps of cotton; they take their part in picking, drying, and sorting the tea-crop; they act as barbers and hairdressers to their own sex, building up erections of false and real hair, with ribbons and pins, which last a week untouched, and because Japanese custom requires the eyebrows to be plucked out after marriage, and any stray hair on the neck and temples to be extracted.

They work at the mechanical part of various arts, such as fan-making, lacquer-box making, the polishing of mirrors, and so on; but they have not been allowed to compete with men in the more skilled labors. The fans are not painted, but put together by them, and even a painter of mere signs would disdain to teach his art to a woman. On the other hand, in music they may take an equal share; in fact, it is really more practiced by women than men. They are more commonly to be seen than men in the shops of some of the large cities, such as Yedo, with the ready-reckoner for ever between their fingers, managing and serving. Wherever there is a "local manufacture," the women take part in it. The peasants' wives go to market to sell and buy, and if they have any distance to go, instead of jolting along in a cart, they hang their wares in baskets to the horses' sides, or pile them under the high saddle, which they then mount like men, having never heard of side-saddles. That is what the poor people do. "Ladies" take a norimon or a kango in such cases, and if they are very great ladies indeed, their norimon is borne by four men, but otherwise by two.

HUMAN BEASTS OF BURDEN.

Everywhere men—and women too, when the men are otherwise employed—are used as beasts of burden in a way that strikes foreigners painfully at first. You will see men on the coldest days in winter, scarcely clothed at all, flying along with the post-bag, or with a live fish, wrapped in straw, slung across their shoulders, which they are bound to deliver in an hour to some epicure who likes his fish fresh from the sea. Then there are the jinrikishas, in which men act as horses, going at six miles an hour, and who suffer much from complaints of the heart in consequence, and are liable to sudden and early deaths. Then, where other people would perhaps use a ferry-boat, many a poor man is glad to get his living by carrying people and packages across the river. Here, again, you can see the difference between the well-to-do lady, who sits at ease on a kind of tray with poles, carried by four men, and the poor woman, who trusts to one man's shoulders for her safety.

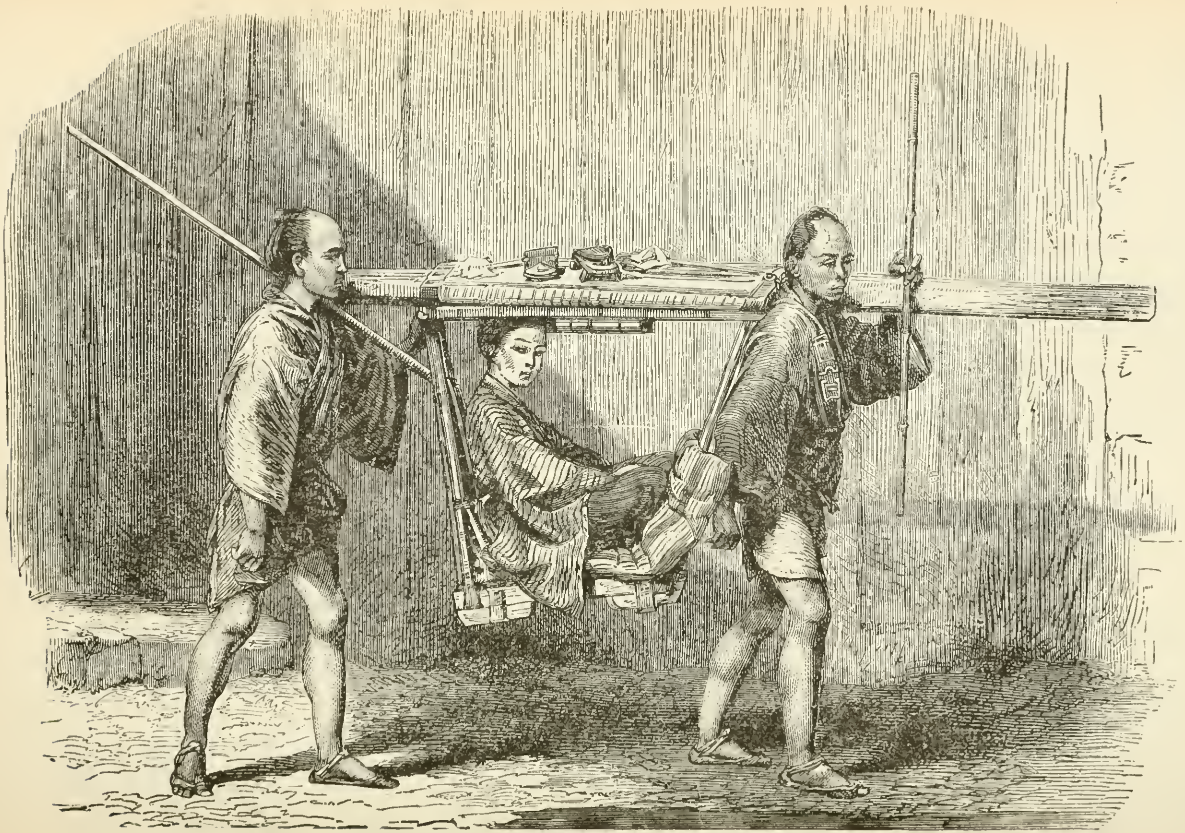
One of the flourishing professions of women is fortune-telling. The divining-woman is consulted by all classes. She professes to be a medium, and says that the spirits she is in communication with speak through her voice when suitably summoned. Every one wears charms and amulets. When the small-pox rages, anxious parents write outside their houses that their children are away from home, and fancy that the spirit which brings the disease will be cheated by seeing the inscription!

They carry tiny figures of their favorite god or goddess in little embroidered scarlet bags, made on purpose, within the sleeves or girdles, and think that to let one drop by accident is a certain sign of speedy death. But the number of omens they believe in is endless.

THE STRANGE BELIEF IN WIZZARDS.

Thus they are only too ready to take a professed "medium" at her word, and call her in to know if a sick person will recover, if a traveler will return safely, if they will be happily married, if their enterprises will turn out prosperously—anything and everything. The same superstition leads some of them to try to please the gods, or rather to escape their displeasure, by retiring from the world and living a life of inactive contemplation. This is dying out, as the power of Buddhism dies away. Shintoism has never had life enough in it to inspire such sacrifices, but sometimes, here and there, you may find a true ascetic—a hermit—perched, like the baby of the nursery rhyme, in the tree-top, living by the charity and reverence of passers-by, who hoist his food to the holy man, and thankfully receive his blessings in return, as heavenly payment for an earthly gift.

One reason for the excellence of Japanese art is, that the artists, instead of copying from each other, invariably go to nature for their models. They have teachers just as we do, but the great object of these professors is to teach their pupils how to produce the greatest effect with the fewest lines. Book after book may be seen entirely filled with studies for the guidance of the young artists, in which the master has depicted various scenes with as few lines as possible. One of these books is entirely filled with studies of falling rain, and, monotonous as the subject may seem, no two drawings are in the least alike, and a separate and forcible character is given to each sketch. Another book has nothing but outlines of landscape scenery, while some are entirely filled with grass-blades, some bending in the wind, others beaten down by rain, and others flourishing boldly upright. The bamboo is another favorite subject; and so highly do the Japanese



A JAPANESE LADY IN HER PALANQUIN.

prize the skill displayed by a master, that they will often purchase at a high price a piece of paper with nothing on it but a few strokes of the brush, the harmony of the composition and the balance of the different lines of beauty being thoroughly appreciated by an artistic eye.

Studying as the Japanese do in the school of nature, they are marvelously apt at expressing attitude, whether of man, beast, or bird. They never have any difficulty in disposing of the arms of their figures, and, no matter what may be the action, there is always an ease about it which betrays the artist's hand even in the rudest figures. Among living objects the crane appears to be the special favorite of the Japanese, its popularity being shared, though not equaled, by the stork and the heron.

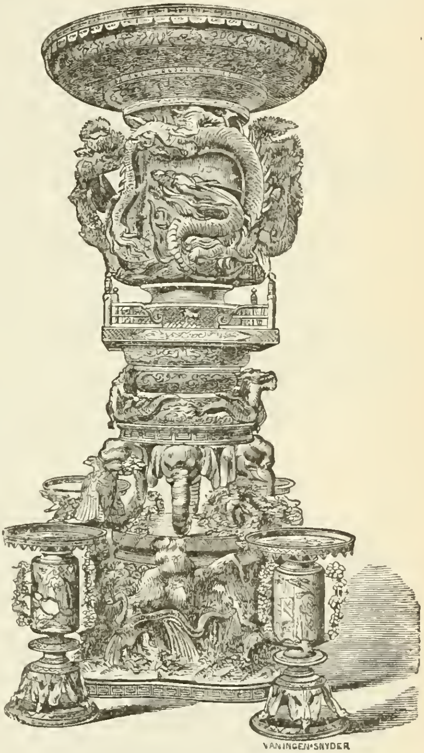
These birds are protected both by law and popular opinion, and in consequence are so tame that the native artists have abundant opportunities of studying their attitudes, which they do with a patient love for the subject that is almost beyond praise. No figure is so frequently introduced in Japanese art as the crane, and so thoroughly is the bird understood, that it is scarcely possible to find in all the figures of cranes, whether cast in bronze, drawn on paper, or embossed and painted on articles of furniture, two specimens in which the attitude is exactly the same. With us, even the professional animal painters are apt to take a sketch or two, and copy them over and over again, often repeating errors as well as excellencies, while the Japanese artist has too genuine a love for his subject to descend to any such course. Day by day he studies his living models, fills his book with sketches taken rapidly, but truly, and so has always at hand a supply of genuine and original attitudes.

The porcelain of the Japanese is singularly beautiful, and sometimes is adorned with ornaments which may be reckoned under the head of "conceits." For instance, a cup will be adorned with a representation of pleasure boats on the river. With a needle the tiny windows of the boats can be raised, when a party of ladies and gentlemen drinking tea are discovered inside the boat. Sometimes a little tortoise may be seen reposing quietly at the bottom of the cup, until the hot tea is poured into it, when the creature rises to the surface, shaking its head and kicking with its legs as if in pain from the hot liquid.

In Japanese pictures certain curious figures may be seen, looking as if human beings had been wrapped in a bundle of rushes. This strange costume is the snow-cloak of the ordinary Japanese. For mere rain the Japanese generally wear a sort of overcoat made of oiled paper, very thin, nearly transparent, and very efficient, though it is easily torn. But when a snow-storm comes on, the Japanese puts on another garment, which is made in a way equally simple and effective, and affords him protection from the inclement weather.

A sort of skeleton is made of network, the meshes being about two inches in diameter. Upon each point of the mesh is tied a bunch of vegetable fibre, like very fine grass, the bundles being about as thick as an ordinary pencil where they are tied, and spreading toward the ends. The garment thus made is exceedingly light, and answers its purpose in the most admirable manner. The bunches of fibres overlapping each other like the tiles of a house, keep the snow far from the body, while any snow that may melt simply runs along the fibres and drops to the ground. To wet this snow cloak through is almost impossible, even the jet of a garden engine having little effect upon it except when quite close, while no amount of snow would be able to force a drop of water through the loose texture of the material.

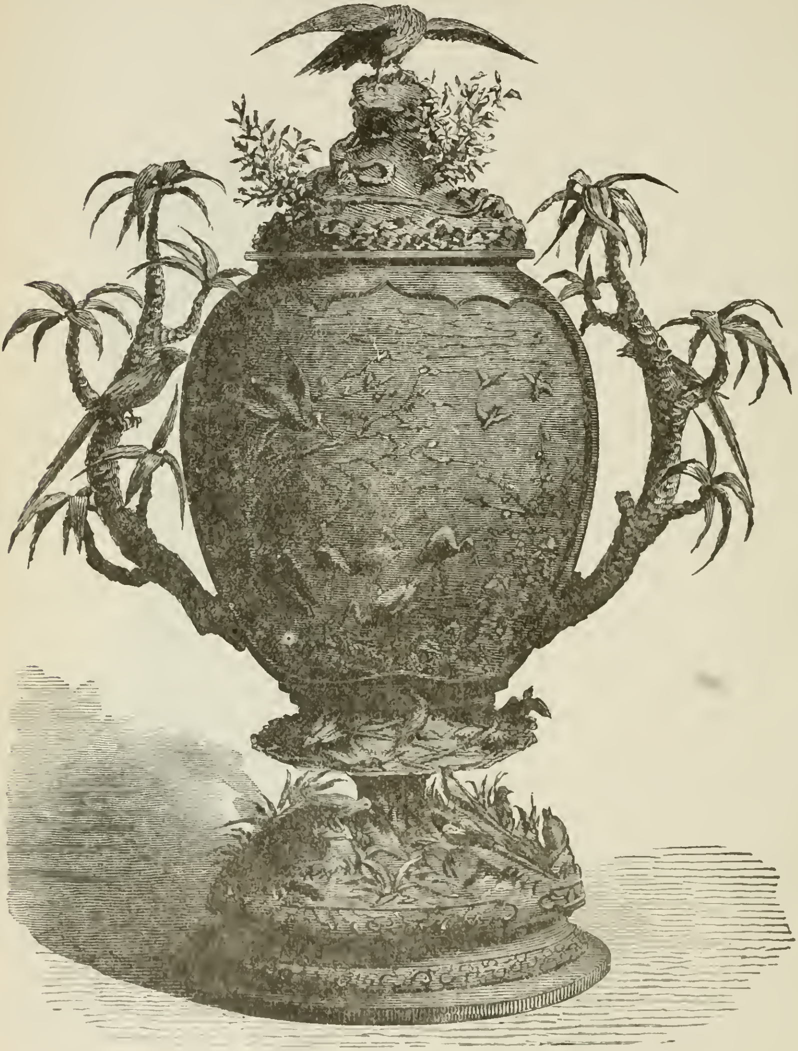
The Japanese silks have long been celebrated, but there is one kind of which scarcely anything is known among us. A number of rolls of silk were once presented to the members of a foreign embassy. They were all in strips about three yards long and one wide, so that they seemed to be useless. They happened, however, to be exceedingly valuable; in fact, absolutely priceless, as no money could buy them. They were made by exiled nobles, who were punished by being sent to the island of Fatsizio, where they spend their time in making these peculiar silks. No one below a certain rank is allowed to wear the silk which has been woven by noble fingers, or even to have the fabric in the house, and in consequence not a piece ever even found its way to the shops.



HIGHLY FIGURED JAPANESE VASE.

From an interesting account of a dinner given to General Grant when he visited Japan, we may get a good idea of some of the Japanese customs. The narrative, after describing the beauty of the grounds surrounding the temple where the festivities took place, proceeds as follows:

The servants have brought in the candles. Before each table is a pedestal on which a candle burns, and the old temple lights up with a new splendor. To add to this splendor the wall has been draped with heavy silks, embroidered with gold and silver, with quaint and curious legends of the history of Japan. These draperies lend a new richness to the room, and you admire the artistic taste which suggested them. The merchants enter bearing meats. Advancing to the centre of the



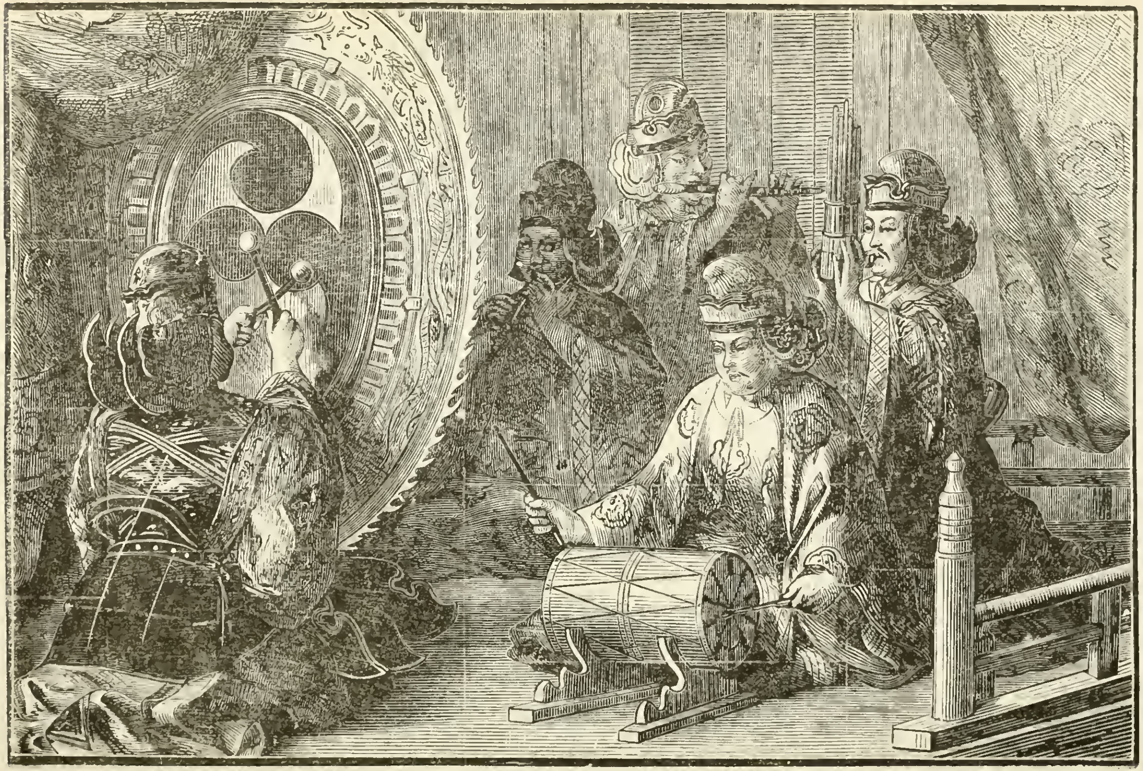
A REMARKABLE JAPANESE BRONZE VASE.

room, and to the General, they kneel and press their foreheads to the floor. With this demure courtesy the course begins. Other attendants enter, and place on each table the lacquer bowls and dishes. Instead of covering the tables with a variety of food and tempting you with auxiliary dishes of watermelon seeds and almond kernels, as in China, the Japanese give you a small variety at a time. I am afraid, however, we have spoiled our dinner. Our amiable friend, the Japanese Minister, warned us in the beginning not to be in a hurry, to restrain our curiosity, not to hurry our investigations into the science of a Japanese table, but to pick and nibble and wait—that there were good things coming, which we should not be beyond the condition of enjoying. There is no bread and no wine, and our only drink is the hot preparation from rice with its sherry flavor, which is poured out of a teapot into shallow lacquer saucers, and which you sip, not without relish, although it has no place in any beverage known to your experience. We are dining, however, in strict Japanese fashion, just as the old daimios did, and our hosts are too good artists to spoil a feast with champagne. Then it has been going on for hours, and when you have reached the fourth hour of a dinner, even a temperance dinner, with nothing more serious than a hot insipid sherry-like rice drink, you have passed beyond the critical and curious into the resigned condition. If we had only been governed by the Minister we might have enjoyed this soup, which comes first in the course, and as you lift the lacquered top you know to be hot and fragrant. It is a soup composed of carp and mushroom and aromatic shrub. Another dish is a prepared fish that looks like a confection of cocoanut, but which you see to be fish as you prod it with your chopsticks. This is composed of the red snapper fish, and is served in red and white alternate squares. It looks well, but you pass it by as well as another dish that is more poetic at least, for it is a preparation of the skylark, wheat flour cake and gourd. We are not offended by the next soup, which comes hot and smoking, a soup of buckwheat and egg-plant. You push your soup to the end of the table and nip off the end of a fresh cigar, and look out upon the town over which the dominant universe has thrown the star-sprinkled mantle of night, and follow the lines of light that mark the welcome we are enjoying, and trace the ascending rockets as they shoot up from the hillside to break into masses of dazzling fire and illuminate the heavens for a moment in a rhapsody of blue and scarlet and green and silver and gold.

If you have faith you will enter bravely into the dish that your silk-draped attendant now places before you, and as he does, bows to the level of the table and slides away. This is called oh-hira, and was composed, I am sure, by some ambitious daimio, who had given thought to the science of the table and possessed an original genius. The base of this dish is panyu. Panyu is a sea fish. The panyu in itself would be a dish, but in addition we have a fungus, the roots of the lily and the stems of the pumpkin. The fungus is delicate, and reminds you of mushroom, but the pumpkin, after you had fished it out and saw that it was a pumpkin seemed forlorn and uncomfortable, conscious no doubt of a better destiny in its New England home than flavoring a mess of pottage. What one objects to in these dishes is the objection you have to frogs and snails. They lack dignity. And when we come to real American food, like the pumpkin and buckwheat, we expect to see it specially honored, and not thrown into a pot boiled in mixed company. The lily roots seemed out of place. I could find no taste in them, and would have been content to have known them as turnips. But your romantic notions about the lily—the lines you have written in albums, the poetry and water colors—are dispelled by its actual presence in a boiled state, with arrowroot and horse-radish.

GROUPS OF MAIDENS MAKING MUSIC.

While our hosts are passing around the strange dishes a signal is made and the musicians enter. They are maidens with fair, pale faces, and small, dark, serious eyes. You are pleased to see that their teeth have not been blackened, as was the custom in past days, and is even now almost a prevalent custom among the lower classes. We are told that the maidens who have come to grace our feast are not of the common singing class, but the daughters of the merchants and leading citizens of Nagasaki. The first group is composed of four. They enter, sit down on the floor and bow their heads in salutation. They wear the costume of the country, the costume that was known before the new days came upon Japan. They have blue silk gowns, white collars and heavily brocaded pearl-colored sashes. After they had played an overture another group entered, fourteen maidens similarly dressed, each carrying the small banjo-like instrument and ranging themselves on a bench against the wall, the tapestry and silks suspended over them. Then the genius of the artist was apparent, and the rich depending tapestry, blended with the blue and white and pearl, and animated with the faces of the maidens, their music and their songs, made a picture of Japanese life which an artist might regard with envy. You see then the delicate features of Japanese decoration which have bewitched our artist friends, and which the most adroit fingers in vain try to copy. When the musicians enter the song begins. It is an original composition. The theme is the glory of America and honor to General Grant. They sing of the joy that his coming has given to Japan, of the interest and pride they take in his fame; of their friendship for their friends



JAPANESE MUSICIANS,

across the great sea. This is all sung in Japanese, and we follow the lines through the mediation of a Japanese friend who learned his English in America. This anthem was chanted in a low, almost monotonous key, one singer leading in a kind of solo and the remainder coming in with a chorus. The song ended, twelve dancing maidens entered. They wore a crimson-like overgarment fashioned like pantaloons—a foot or so too long—so that when they walked it was with a dainty pace, lest they might trip and fall. The director of this group was constantly on his hands and knees, creeping round among the dancers keeping their drapery in order, not allowing it to bundle up and vex the play. These maidens carried bouquets of pink blossoms, artificially made, examples of the flora of Japan. They stepped through the dance at as slow a measure as in a minuet of Louis XIV. The movement of the dance was simple, the music a humming thrumming, as though the performers were tuning their instruments. After passing through a few measures the dancers slowly filed out and were followed by another group, who came wearing masks—the mask in the form of a large doll's face—and bearing children's rattles and fans. The peculiarity of this dance was that time was kept by the movement of the fan—a graceful, expressive movement which only the Eastern people have learned to bestow on the fan. With them the fan becomes almost an organ of speech, and the eye is employed in its management at the expense of the admiration we are apt at home to bestow on other features of the amusement. The masks indicated that this was a humorous dance, and when it was over four special performers, who had unusual skill, came in with flowers and danced a pantomime. Then came four others, with costumes different—blue robes, trimmed with gold, who carried long, thin wands, entwined in gold and red, from which dangled festoons of pink blossoms.

All this time the music hummed and thrummed. To vary the show we had even a more grotesque amusement. First came eight children, who could scarcely do more than toddle. They were dressed in white, embroidered in green and red, wearing purple caps formed like the Phrygian liberty cap and dangling on the shoulders. They came into the temple inclosure and danced on the graveled walk, while two, wearing an imitation of a dragon's skin, went through a dance and various contortions, supposed to be a dragon at play. This reminded us of the pantomime elephant, where one performer plays the front and another the hind legs. In the case of our Japanese dragon the legs were obvious, and the performers seemed indisposed even to respect the illusion. It was explained that it was an ancient village dance, one of the oldest in Japan, and that on festive occasions, when the harvests are ripe or when some legend or feat of heroism is to be commemorated, they assemble and dance it. It was a trifling, innocent dance, and you felt as you looked at it, and, indeed, at all the features of our most unique entertainment, that there was a good deal of nursery imagination in Japanese fêtes and games.

A more striking feature was the decorations which came with the second course of our feast. First came servants, bearing two trees, one of the pine, the other of the plum. The plum tree was in full blossom. One of these was set on a small table in front of Mrs. Grant, the other in front of the General. Another decoration was a cherry tree, surmounting a large basin, in which were living carp fish. The carp has an important position in the legends of Japan. It is the emblem of ambition and resolution. This quality was shown in another decoration, representing a waterfall, with carp climbing against the stream. You will note, however, as our dinner goes on it becomes bizarre and odd, and runs away with all well-ordered notions of what even a daimio's dinner should be. The soups disappear. You see we have only had seven distinct soups served at intervals, and so cunningly prepared that you are convinced that in the ancient days of Japanese splendor soup had a dignity which it has lost.

The music is in full flow, and the lights of the town grow brighter with the shades of darkening night, and some of the company have long since taken refuge from the dinner in cigars, and over the low brick wall and in the recesses of the temple grounds crowds begin to cluster and form, and below, at the foot of the steps, the crowd grows larger and larger, and you hear the buzz of the throng and the clinking of the lanterns of the chair-bearers, for the whole town is in festive mood, and high up in our open temple on our hillside we have become a show for the town. Well, that is only a small return for the measureless hospitality we have enjoyed, and if we can gratify an innocent curiosity, let us think of so much pleasure given incidentally to others.

A ROYAL WELCOME TO GENERAL GRANT.

The customs which prevail at the royal court of Japan will be seen from a graphic description of the Emperor's reception of his distinguished visitor, furnished by one of the party.

The Japanese, with a refinement of courtesy quite French in its way, were solicitous that General Grant should not have any special honors in Japan until he had seen the Emperor. It was felt that as the General was the guest of the nation he should be welcomed to the nation by its chief. They were also anxious that the reception should take place on the Fourth of July. Their imaginations had been impressed by the poetry of the idea of a reception to one who had been the head of the American nation, on the anniversary of American Independence.

The hour for our reception was two in the afternoon. The day was very warm, although in our palace on the sea we have whatever breeze may be wandering over the Pacific Ocean. General Grant invited some of his friends to accompany him. At half-past one Mr. Bingham, our Minister, arrived, and our party immediately drove to the palace. The home of the Emperor is a long distance from the home of the General. The old palace was destroyed by fire, and Japan has had so many things to do that she has not built a new one. The road to the palace was through the section of Tokio where the old daimios lived when they ruled Japan as feudal lords, and made their occasional visits to the capital. There seems to have been a good deal of Highland freedom in the manners of the old princes. Their town houses were really fortifications. A space was inclosed with walls, and against these walls chambers were built—rude chambers, like winter quarters for an army. In these winter quarters lived the retainers, the swordsmen and soldiers. In the centre of the inclosure was the home of the lord himself, who lived in the midst of his people, like a general in camp, anxious to fight somebody, and disappointed if he returned to his home without a fight. A lord with hot-tempered followers, who had come from the restraints and amenities of home to have a good time at the capital, and give the boys a chance to distinguish themselves and see the world, would not be a welcome neighbor. And as there were a great many such lords, and each had his army and his town fortress, the daimio quarter became an important part of the capital. Some of the houses were more imposing than the palace—notably the house of the Prince of Satsuma. There was an imposing gate, elaborately buttressed and strengthened, that looked quite Gothic in its rude splendor. These daimio houses have been taken by the government for schools, for public offices, for various useful purposes. The daimios no longer come with armies and build camps and terrorize over their neighbors and rivals.

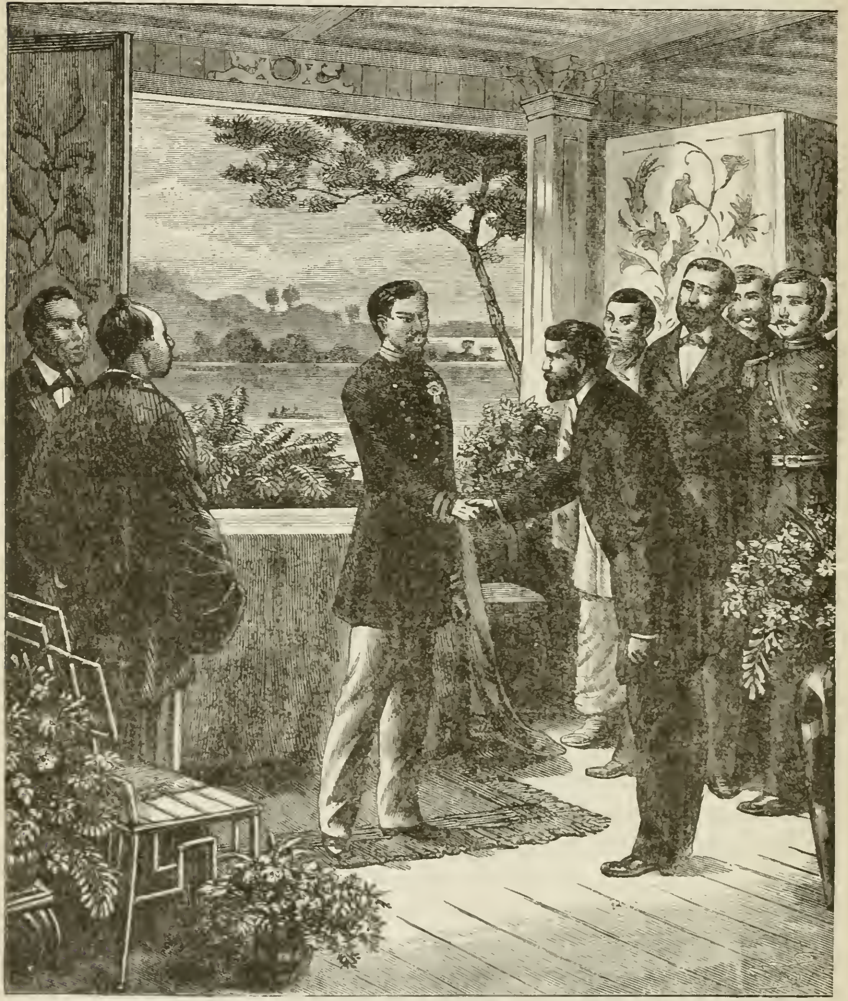
We drove through the daimios' quarter and through the gates of the city. The first impression of Tokio is that it is a city of walls and canals. The walls are crude and solid, protected by moats. In the days of pikemen and sword-bearers there could not have been a more effective defence. Even now, it would require an effort for even a German army to enter through these walls. They go back many generations. I do not know how many. In these lands nothing is worth recording that is not a thousand years old, and my impression is that the walls of Tokio have grown up with the growth of the city, the necessities of defence, and the knowledge of the people in attack and defence. We passed under the walls of an inclosure which was called the castle. Here we are told the Emperor will build his new palace.

We crossed another bridge—I think there were a dozen altogether in the course of the drive—and came to a modest arched gateway, which did not look nearly as imposing as the entrance to the palace formerly occupied by the great Prince Satsuma. Soldiers were drawn up and the band played "Hail Columbia." Our carriages drove on past one or two modest buildings, and drew up in front of another modest building, on the steps of which the Minister Iwakura was standing. The General and party descended and were cordially welcomed and escorted up a narrow stairway into an anteroom. When you have seen most of the available palaces in the world, from the glorious home of Aurungzebe to the depressing mighty cloister of the Escurial, you are sure to have preconceived notions of what a palace should be, and to expect something unique and grand in the home of the long-hidden and sacred Majesty of Japan. The home of the Emperor was as simple as that of a country gentleman. We have many country gentlemen with felicitous investments in petroleum and silver who would disdain the home of a prince who claims direct descent from heaven, and whose line extends far beyond the Christian era. What marked the house was its simplicity and taste; qualities for which my palace education had not prepared me. You look for splendor, for the grand—at least the grandiose—for some royal whim, like the holy palace near the Escurial, which cost millions, or like Versailles, whose cost is among the eternal mysteries. Here we are in a suite of plain rooms, the ceilings of wood, the walls decorated with natural scenery—the furniture sufficient but not crowded—and exquisite in style and finish. There is no pretence of architectural emotion. The rooms are large, airy, with a sense of summer about them which grows stronger as you look out of the window and down the avenues of trees. We are told that the grounds are spacious and fine, even for Japan, and that His Majesty, who rarely goes outside of his palace grounds, takes his recreation within the walls.

STRIKING APPEARANCE OF THE EMPEROR AND EMPRESS.

The palace is a low building, one or at most two stories in height. They do not build high walls in Japan, and especially in Tokio, where earthquakes are ordinary incidents, and the first question to consider in building up is how far you can fall. We enter a room where all the Ministers are assembled. The Japanese Cabinet is a famous body, and tested by laws of physiognomy would compare with that of any Cabinet I have seen.

A lord in waiting, heavily braided, with a uniform that Louis XIV. would not have disliked in Versailles, comes softly in and makes a signal, leading the way. The General, and Mrs. Grant, escorted by Mr. Bingham, and our retinue followed. The General and the Minister were in evening dress. The naval officers were in full uniform, Colonel Grant wearing the uniform of lieutenant-colonel. We walked along a short passage and entered another room, at the further end of which were standing the Emperor and Empress. Two ladies in waiting were near them, in a sitting, what appeared to be a crouching attitude. Two other princes were standing. These were the only occupants of the room. Our party slowly advanced, the Japanese making a profound obeisance, bending the head almost to a right angle with the body.

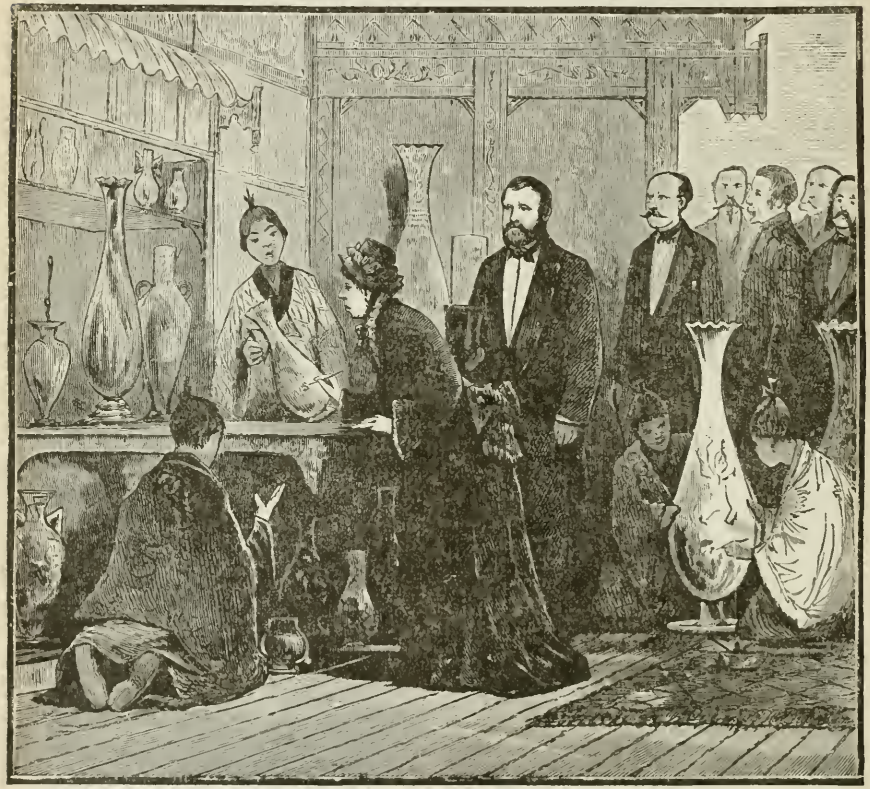


GENERAL GRANT MEETING THE EMPEROR OF JAPAN.

The royal princes formed in line near the Emperor, along with the princesses. The emperor stood quite motionless, apparently unobservant or unconscious of the homage that was paid him. He is a young man with a slender figure, taller than the average Japanese and of about the middle height, according to our ideas. He has a striking face, with a mouth and lips that remind you something of the traditional mouths of the Hapsburg family. The forehead is full and narrow, the hair and the light moustache and beard intensely black. The color of the hair darkens what otherwise might pass for a swarthy countenance at home. The face expressed no feeling whatever, and but for the dark, glowing eye, which was bent full upon the General, you might have taken the imperial group for statues. The empress wore the Japanese costume, rich and plain. Her face was very white, and her form slender and almost childlike. Her hair was combed plainly and braided with a gold arrow. The solemn etiquette that pervaded the audience-chamber was peculiar, and might appear strange to those familiar with the stately but cordial manners of a European Court. But one must remember that the Emperor holds so high and so sacred a place in the traditions, the religion and the political system of Japan that even the ceremony of to-day is so far in advance of anything of the kind ever known in Japan that it might be called a revolution. The Emperor, for instance, as our group was formed, advanced and shook hands with the General.

THE EMPEROR'S EXTRAORDINARY CONDESCENSION.

That seems a trivial thing to write about, but such an incident was never known in the history of Japanese majesty. Many of these details may appear small, but we are in the presence of an old and romantic civilization, slowly giving way to the fierce, feverish pressure of European ideas, and you can only note the change in those incidents which would be unnoticed in other lands. The incident of the Emperor of Japan advancing toward General Grant and shaking hands becomes a historic event of consequence, and as such I note it. The manner of the Emperor was constrained, almost awkward, the manner of a man doing a thing for the first time, and trying to do it as well as possible. After he had shaken hands with the General, he returned to his place, and stood with his hand resting on his sword, looking on at the brilliant, embroidered, gilded company as though unconscious of their presence. Mr. Bingham advanced and bowed, and received just the faintish nod in recognition. The other members of the party were each presented by the Minister, and each one standing about a dozen feet from the Emperor stood and bowed. Then the General and Mrs. Grant were presented to the princesses, each party bowing to the other in silence. This royal reception past, there were various sights which claimed the attention of the visitors. The narrative continues: A few mornings before we left Euriokwan there was another experience. Our hosts had sent us some workers in pottery to show us the skill of the Japanese in a department of art in which they have no superiors. One of the famous potters had expressed a desire to show the General his work. After breakfast we found the artisans arranged in the large drawing-room. There was the chief worker, a solemn, middle-aged person, who wore spectacles. He was dressed in his gala apparel, and when we came into the room went down on his face in Japanese style. There were three assistants. One worked the wheel. Another baked the clay. A third made himself generally useful. The chief of the party was a painter. We saw all the processes of the manufacture, the inert lump of clay going around and around, and shaping itself under the true, nimble fingers of the workmen into cups and vases and bowls. There is something fascinating in the labors of the wheel, the work is so thoroughly the artisan's own, for when he begins he has only a lump



AMERICANS VISITING A JAPANESE POTTERY.

of mud and when he ends his creation may be the envy of a throne room. It seems almost like a Providence, this taking the dust of the valley and creating it, for the work is creation, and we are reminded of Providence in remembering that when the Creator of all fashioned His supreme work it was made of clay. The decoration of the clay was interesting, requiring a quick, firm stroke. We were requested to write something on the clay before it went into the furnace. General Grant gave his autograph and the rest of us inscriptions written, as well as we could write, with a soft, yielding brush. After the inscriptions had been written the cups were washed in a white substance and hurried into the furnace. When they came out the fire had evaporated the coating and turned into a gloss the tints of our writing and the painters' colors had changed, and our inscriptions were permanent.

A JAPANESE LADY ON HORSEBACK.

A common mode of traveling in Japan, especially among the wealthier classes, is by the palanquin, or chair carried by men. Horseback riding is another mode, employed by the wealthier class, and is worth describing.

The attitude and general appearance of a female equestrian in Japan differ considerably from those of our own country. Side-saddles are unknown, the fair rider perching herself upon a saddle which lifts her high above the back of the animal, concealing her body downward, holding on tightly by the front part of the saddle, and, in fact, giving herself a look very much resembling that of a gayly attired monkey on horseback. This mode of riding is even followed by the opposite sex, the retainers of the high nobles sitting in their lofty saddles in very much the same attitude as that employed by the women, and being in consequence absolutely useless, except in looks, as cavalry.

Yet, when they choose, the Japanese can ride tolerably, as is shown by the fact of a game which is played among them, in which the competitors are all mounted. In this game the players have to contend against very great disadvantages. In the first place, the horses which they bestride are wretched animals, mere rough ponies, and the accoutrements are so clumsy, that it is a wonder how the horse can be guided at all. According to our ideas, a horse is guided by the pressure of the leg and the touch of the rein, but the Japanese saddles render such guidance impossible.

The former mode is prevented by the shape of the saddle, which has large flaps of stiff leather hanging so low that the heel or knee of the rider has no effect upon the animal; and the latter mode is nearly as impossible as the former, by reason of the bit and the fashion of riding. The bit is a mere light snaffle placed loosely in the mouth, and the reins are used, not so much for the purpose of guiding the horse, as of keeping the rider in his seat. The horsemen grasp a rein tightly in each hand, and so hang to the bit. The natural consequence is, that the mouths of the horses are nearly as tough as the leather saddle-flaps, and the animals always go with their noses in the air, so as to counteract the perpetual haul on the bridle.

The strangest part of horse equipment in Japan is, however, the shoe. Our idea of a horseshoe is a metallic plate to protect the horse against hard ground. The Japanese shoe is made of plaited straw, and is, in fact, nothing more than a straw sandal tied to the foot, giving it a very clumsy appearance. As may be imagined, their shoes never last very long, and on a stony road are soon cut to pieces. The rider, therefore, takes a supply of shoes with him, and renews them as fast as they are worn out. Indeed, a journey is often roughly calculated as a distance of so many shoes.

Under such circumstances, it is not surprising that the horse is seldom used in traveling. None but a poor noble will condescend to ride from one place to another, as it might be supposed that he could not afford the retinue which is required to carry him. Sometimes a nobleman will condescend to ride in public, but then his horse must be held by two grooms, who tug continually at the poor animal's mouth, and shout continually, "Chai! Chai!" meaning gently, for haste is always thought undignified by the Japanese, and a person of consideration would suffer a great infraction of dignity if he allowed himself to hurry on the road.

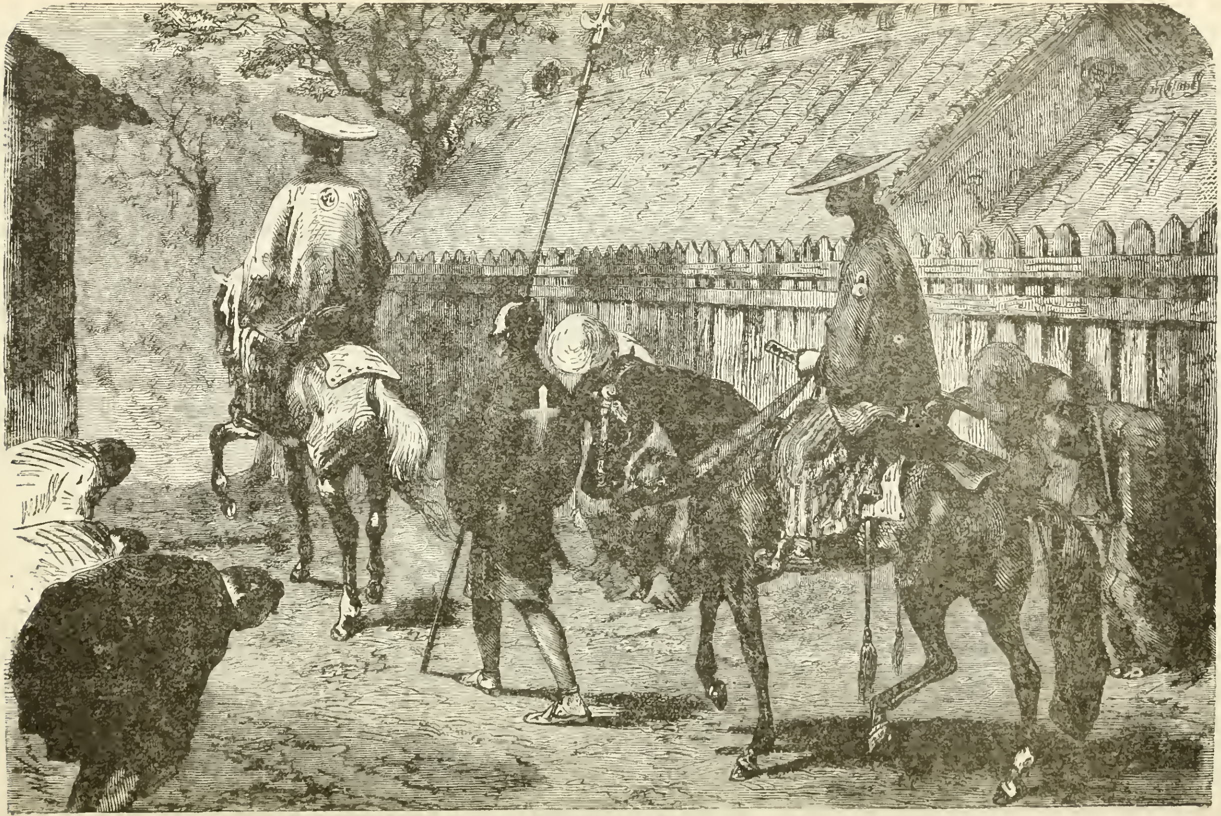
RELIGIOUS BELIEFS AND PRACTICES IN JAPAN.

One of the world's remarkable facts is that no nation can be found without a religion of some kind. No people have yet been discovered without customs and practices which can be accounted for only from the religious instinct and sentiment.

There are two religions in Japan, very different in their original meaning and in their ceremonies, yet not so unlike in results as would be supposed by a stranger. The older and native religion is called Kami-worship, or Shinto; the other is Buddhism. Shinto is a kind of worship of ancestors, or of warriors, or public benefactors, who lived long ago. Their memorable deeds are to be had in remembrance.

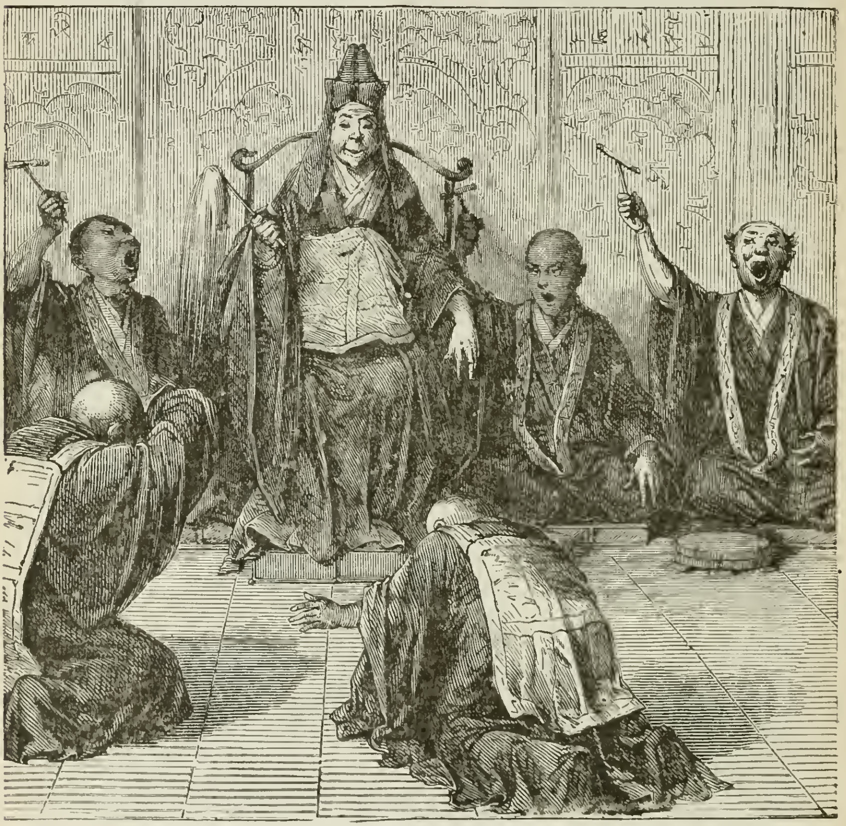
The Shinto sacred book, "The Book of Ancient Traditions," only contains stories of gods and heroes. The Shinto commandments, which the adherents of this faith must observe, are these:—

1. Thou shalt honor the gods, and love thy country.
2. Thou shalt clearly understand the principles of heaven (religion), and the duty of man.
3. Thou shalt revere the Mikado as thy sovereign, and obey the will of his court.



A JAPANESE NOBLE PASSING THROUGH THE STREETS OF A TOWN.

Shintoism was the religion of the Japanese as far back as we have records, and reverence for the Mikado or Emperor is a part of it. The Shinto Bible, written about the year 712 of our era, professes to give the date of the first Mikado, and of all his successors up to that period; and although it is not certain that he ever really existed, the years are dated from his supposed reign. He is represented as having been a divine being, descended from the "Sun-Goddess," while it is said that Japan was created before any other country, and so it is called "The Land of the Gods," a name popular among the people.



SINGULAR CEREMONIES OF BUDDHIST PRIESTS.

It is supposed by those who study history most, that the Demi-gods, Mikados and heroes of early traditions may have been real people, who came later from Asia, and were cleverer and wiser than those they reigned over, so that the ignorant and simple natives, overawed and dazzled, ascribed to them many absurd things that they could not do.

A few years ago, when an American steamer was seen in a Japanese harbor, the people would pray that the foreign sorcerers, who had power over a volcano to tame and use it for their purposes, might be sent away from their shores.

It was thought by many Japanese that Europeans and Americans were not even men, but some kind of dragon-sorcerers, and that the chimney of the steamer was puffing out the breath of the great Fire-spirit. Hence they regarded it with a singular awe.

As a rule, Shintoism has been the religion favored by the Mikado's Government, as a means of promoting loyalty and patriotism. The Shinto temples and the Mikado's palace are built alike, and called by the same word to express their sacredness. There are no idols in the temples. A mirror of polished metal is placed on a stand in the innermost court, and is supposed to be a symbol of the presence of the gods. It is believed, too, that a guilty man's face is reflected back to him distorted, if he dare to gaze on it. Besides the mirror, there is a wooden wand called the gohei, with slips of white paper tied to it and hanging down, which has some similar meaning, but no one knows clearly what. A gohei is often put up in " groves and high places," and prayers are said before it.

The Mikado's palace and the Shinto temples are built of fine-grained wood, with steep, thatched roofs ; and no paint, gilding, or ornament is allowed to defile them. No sacrifices are made, but offerings are daily laid before the altars. Pigeons are considered sacred, and kept in flocks in the Temple gardens ; they perch on a cross-bar joining two upright beams, which is called a Tori, and is in front of every Shinto temple, and some Buddhist temples also. The Shinto priests marry ; they do not shave their heads, nor do they dress differently from other people, except when officiating ; then they dress in pure white robes and high lacquer caps. Their office goes from father to son. The chief priests are of royal descent, and all are government servants. Sometimes virgin priestesses officiate.

The Buddhist religion was about a thousand years old when it was brought to Japan near A. D. 600. Like Shintoism, it does not profess to be idolatrous, but, like that, it has become so in practice.

It is the popular religion. At first the people did not care for it, but in the ninth century it occurred to a priest that the gods and heroes whom the natives worshiped must certainly be " incarnations of Buddha," and if so, that their images ought to be set up in the Buddhist temples, and his belief spread and was acted on. Then the people turned to the Buddhist religion, and ever since Buddhism and Shintoism have had some gods and some ceremonies in common.

CHAPTER IX.

WONDERS OF THE PACIFIC ISLES.

New Zealand—Rare Products—Tattooing—Strange Customs—Reception of a King—Volcanoes and Boiling Springs—The Bread Tree—New Caledonia—Superstitions—Dances—Coral Islands—New Guinea—Description of the Natives—Savage Fijians—Island of Tahiti—Excitement over a Horse—Sandwich Islands—Volcanic Eruption—Captain Cook and His Death—Surf Swimming—Pitcairn's Island—Singular Monuments—Handsome Marquesians—Island of Java—Marvelous Natural Beauty—Volcano—Animal Life—A Gem Set in the Sea.

NEW ZEALAND properly consists of three islands. The two larger, called North and South, are about as big as Pennsylvania. The little one, south of all, is too small to be of any importance. The fruits and flowers of New Zealand are endless in variety and beauty. Besides many beautiful trees and plants natural to the country, every sort of root and seed introduced by Europeans has grown and flourished, either in the North or South, in a wonderful way. In the North island, the myrtle and scarlet geranium bloom unsheltered all the year round; and grapes, figs, and melons ripen perfectly in the open air, and in the most northern parts, oranges, bananas, and pine-apples; but as tropical fruits of every description are to be obtained so easily from the neighboring South Sea Islands, it is not worth while spending the time in cultivating them.

In the fruit markets side by side with the products of the hottest climates, are gooseberries, currants, cherries and strawberries, which grow in the South Island in the utmost profusion and perfection. All vegetables thrive, as well as the kumera, or sweet potato, grown by the Maories, or natives, and so do our favorite American flowers—rose, honeysuckle, lavender, mignonette, even snowdrops, crocuses and daffodils. Our oak and elm and other trees grow well also; but for trees and flowers New Zealand was well off before the Europeans planted any there. A New Zealand forest in its native wildness is a most beautiful sight, with its infinite variety of pine-trees, evergreens, creepers, and shrubs. Many of the large trees bear lovely flowers, and the ground is carpeted with them. Among the most beautiful plants are the tree-fern and the cabbage palm; the most common is the manuka scrub, which grows all over the island. It is something like a myrtle, and has white, and sometimes pink, blossoms. All the native trees, with one or two exceptions, are evergreen.

A rare kind of flax grows all over the island. The natives have always used it for all sorts of purposes, and it has a value in all countries on account of its quality. It has a very handsome large red flower, and has great sword-shaped leaves. It sometimes grows as high as seven feet, and in a heavy shower of rain a flax-bush makes a capital shelter. The Maories are very fond of sucking the honey which the flowers produce. Before the Europeans came, nearly all their clothing was made from this wonderful flax, not woven, but knotted together in a peculiar manner. The ordinary native dress is a garment of this material, nearly square, about five feet in length and four in breadth. It is fastened round the shoulders by two corners, and round the waist with a girdle. Over this they sometimes wear a large mantle covered with dog-skin. The dress of both women and men is the same. Their ornaments are feathers upon the head, and combs and pearl-shells. In their ears they wear pieces of jasper or green jade and sharks' teeth. The women adorn their necks with strings of sharks' teeth and a particular kind of berry. The feathers worn by the chiefs are considered of great importance, and in some way distinguish the different tribes to which they belong, being both useful and ornamental.

THE PRACTICE OF TATTOOING.

The process of tattooing, as practiced by the natives, is most painful and tedious. A preparation of charcoal is made and placed on a block of wood. Then incisions are made in the skin with a bone instrument dipped in the charcoal. The finer part of the work is finished up with a bone needle, more after the fashion in which sailors tattoo their arms with gunpowder. It used to be the universal custom to begin tattooing a wretched Maori boy at the age of ten, and continue the process at intervals till he was twenty. Many years ago a party of Englishmen were seized and tattooed by the Maories. One of them gives a terrible account of the suffering entailed by it. He was held down by six natives, and the operation lasted for four hours. The Maories themselves, however, do not seem to mind the pain of it, and tattoo their own persons, as well as those of their friends, with the greatest satisfaction. The tattooing of the face of a New Zealander marks the clan or tribe to which he belongs, like the stripes and color of a Highlander's plaid. Besides these distinguishing lines and curves, the intricacies and varieties of the pattern are like a crest or coat-of-arms, and mark the Maori chiefs from the common people, and also enable them to distinguish their enemies in battle. Besides the tattooing, they smear their faces with oil and red ochre, which is considered highly ornamental.

The Maories have many superstitions, some of which are most curious and others very silly and childish. One of the strangest is the "tapu," which means that a thing is sacred—not to be touched. The first missionaries often got into trouble by transgressing these laws unintentionally, and sometimes the Maories would lay traps for them, as it were, putting the sacred object in their way so as to give them an excuse for killing or injuring them. The chiefs are always tapu, especially their heads. Many places are tapu; birds and animals are sometimes tapu. In these days, however, the tapu is not nearly as strict as it used to be; the Maories will often take it off for money. When the Duke of Edinburgh reached the hot lakes in the North Island, the tapu was taken off the very sacred ducks which abound there, for his benefit; so that in such a case as this it really only amounts to a useful preservation of game.

A stranger custom than the tapu is what is called "muru." If any one has an accident or affliction, it is thought a compliment and a token of sympathy to visit him, eat up all his provisions, and sometimes rob him of everything he possesses. There is a very amusing old book called the "Pakeha Maori" (Pakeha means a stranger), which describes this custom of "muru" fully. A man's child fell into the fire and was nearly burned to death. The father was immediately plundered to an extent that almost left him without the means of subsistence—fishing nets, canoes, pigs, provisions, all went. His canoe upset, and he and all his family narrowly escaped drowning; some were perhaps drowned. He was immediately robbed, and well pommeled with a club into the bargain. He might be clearing some land for potatoes, burning off the fern, and the fire spreads further than he intended, and gets into the burial-ground. No matter whether anyone has been buried in it for the last hundred years, he is mercilessly robbed. For ten thousand different causes a man might be thus maltreated. Indeed, in many cases it would have been felt as a slight and an insult not to be robbed—the sacking of a man's establishment being often taken as a high compliment—and to resist the execution would not only have been looked upon as mean and disgraceful in the highest degree, but would have debarred the contemptible individual from the privilege of robbing his neighbor.

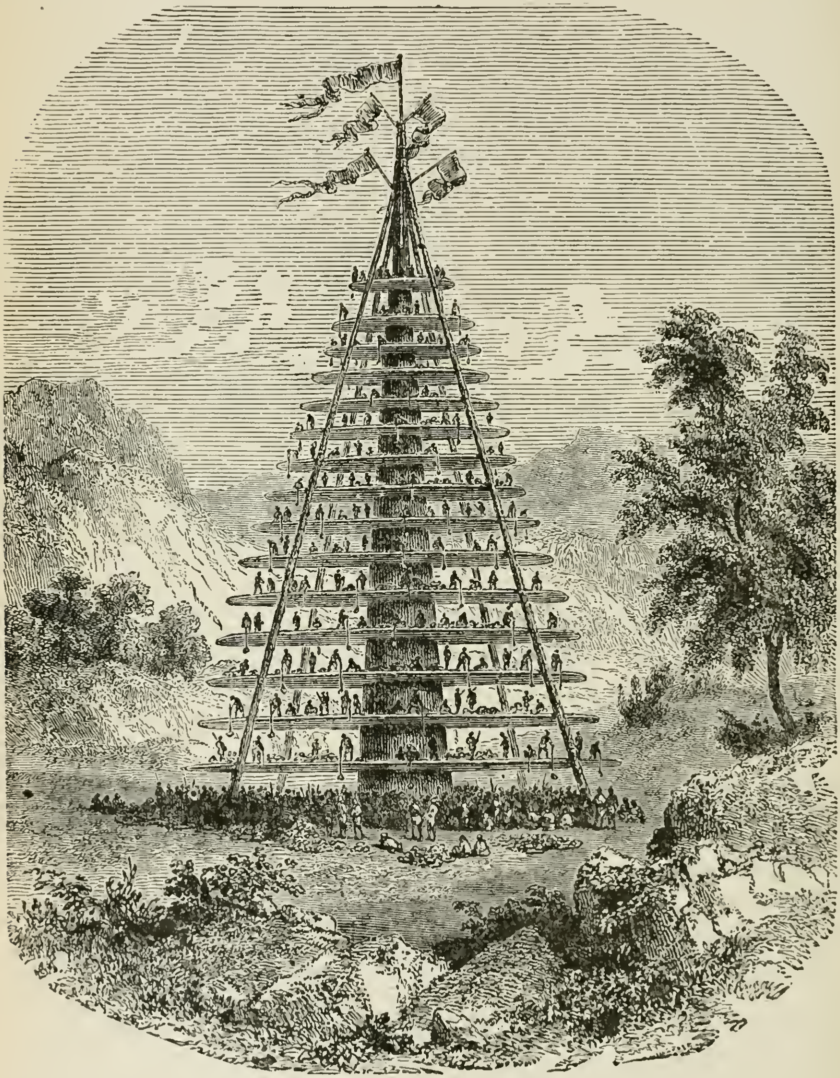
There were many worse superstitions and customs than these, however, against which the missionaries had to contend when they first took up their abode among the Maories. When a chief died, it was considered right and proper to kill a slave immediately, in order that the great man might have a spirit to attend him into another world. On one occasion, a young New Zealander died, the nephew of a chief, who was staying at Sidney. The uncle chief immediately prepared to sacrifice a slave, to accompany the spirit of his nephew, and the missionary's family was only able to save the life of the poor fellow by hiding him. They persuaded the chieftain, with great difficulty, to give up the idea; but he was never thoroughly satisfied about it. He frequently lamented that his nephew had no attendant to the next world, and seemed quite afraid to return to New Zealand lest the father of the young man should reproach him with his neglect. When a chieftain died, one or more of his wives would always make an end to herself, in order that she might accompany her husband. In these days the wives content themselves with covering their heads, and howling and lamenting for days together. These lamentations and certain ceremonies and a great deal of feasting always accompany the death of a chief, and constitute what they call a "tangi"—a very curious custom.

A FRIGHTFUL WELCOME TO STRANGERS.

The first missionaries who visited New Zealand met with an enthusiastic reception, and the account pictures some of the interesting customs which prevail. As they landed, suddenly a woman came running towards them, waving a red mat over her head, and calling out "Haromai, haromai!" "Come hither, come hither!" This, they were assured, was a friendly invitation. So they went forward, and soon found themselves in the midst of warriors and spears. Suddenly the warriors seized their spears, brandished them in the air, uttered the most frightful shrieks and yells, and flung their limbs and bodies about in the most horrible manner. This was, however, really only a compliment to the visitors, and was, in fact, a war dance of welcome. This method of showing pleasure at the presence of guests seems very strange, but other customs of the Maories are not less so. As it was a time of great rejoicing the Maories erected a huge platform eighty or ninety feet high, in the shape of a pyramid. The whole of the structure was covered with people, who literally swarmed upon it, and assisted in decorating it with colored cloths and streamers, and such ornaments as they could afford, giving it a very attractive appearance.

As evening drew on, all the party returned to the ship except two who determined to remain. They had supper of fish and potatoes in one camp, and then walked to another camp, about a mile off, where they were received quite as kindly, and were soon surrounded by chiefs. The first night passed among the natives was a strange one. The narrator describes it in this way: As the evening advanced, the people began to retire to rest in different groups. About eleven o'clock we wrapped ourselves in our great coats, and prepared for rest. The night was clear, the stars shone bright, and the sea in our front was smooth;

around us were innumerable spears, stuck upright in the ground, and groups of natives lying in all directions, like a flock of sheep, upon the grass, as there were neither tents nor huts to cover them. I viewed our present situation with sensations that I cannot express, surrounded by cannibals who had massacred and devoured our countrymen. I wondered much at the mysteries of Providence, and how these things



A MAORI FESTIVAL—WELCOMING VISITORS.

could be. Never did I behold the blessed advantage of civilization in a more grateful light than now. I did not sleep much during the night. My mind was too seriously occupied by the present scene, and the new and strange ideas it naturally excited. About three in the morning I rose and walked about the camp, surveying the different groups of natives. When the morning light returned, we beheld men, women, and children asleep in all directions, like the beasts of the field.

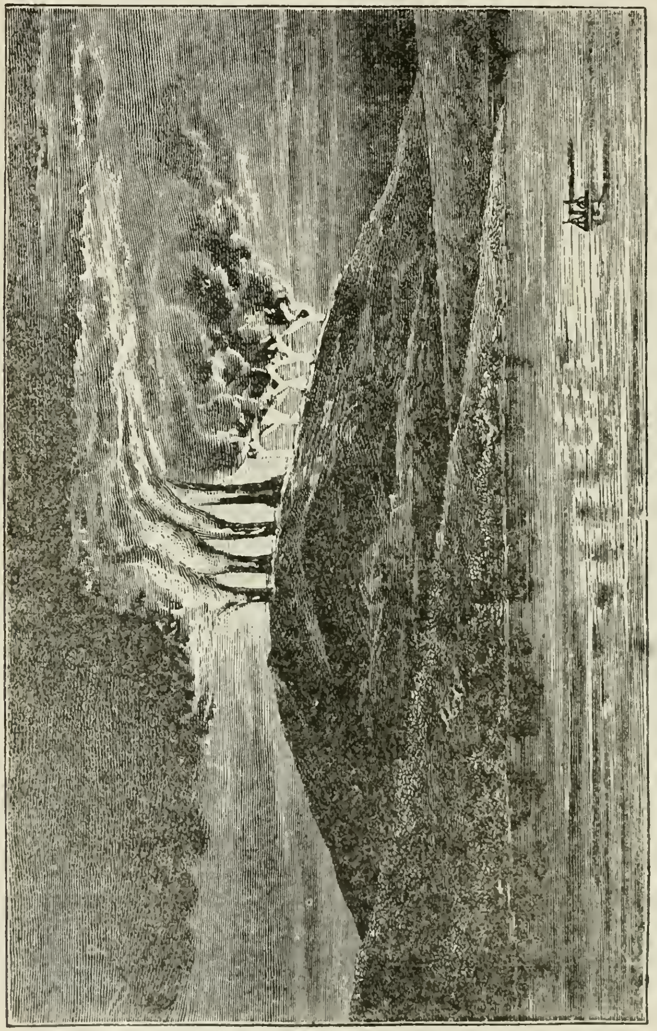
INAUGURATING A KING.

The account of the electing of this first king is very curious. In June, 1858, he was formally accepted at a place called Rangiawhia. He entered it preceded by his flag, bearing the device of a cross and three stars, with the name of the country in the centre. After him came the chiefs and numbers of well-dressed natives. He was received by a procession of the inhabitants of the place, one of the chiefs reading an address of welcome. A volley of musketry was fired by an army of young men, who then marched backwards and fell into lines, so as to form an avenue for the king to pass along, saluting him with another volley. The procession then advanced into a square formed by huts and tents, when at a given signal a profound obeisance was simultaneously made by all the assembly of the different tribes to the king. One of the native teachers then stood up and read a part of a chapter in the Bible, and gave out the verses of a hymn, which were sung. He then offered up a prayer. After a few minutes' silence a song of welcome was chanted by one of the chiefs, another volley fired, another obeisance made, and King Potatau was installed as the first king of the Maori race. He did not live long, and was succeeded by his son.

SPLENDID FORESTS AND VOLCANIC MOUNTAINS.

The forests of New Zealand are chiefly on the mountain ranges. The plains are covered with grass and fern. There is a grand range of volcanic mountains, which runs the entire length of the middle island, crosses the straits between the two islands far down under the sea, reappearing midway at the island of Shapiti. Many of the New Zealand mountains are of volcanic origin, but at present there are only two active ones—Tonganio, in the centre of the north island, and White Island, where the grand precipitous rock called the Sentinel Rock is dedicated to the memory of Captain Cook. The highest mountain in the northern island is a little more than ten thousand feet, but in the middle island there are higher mountains still.

Next to the mountains in size and beauty are the lakes. The largest of all is Lake Taupo, in the centre of the volcanic region in the north island. It is twenty-five miles long and twenty wide, and enormously deep—so deep that its depth has never yet been ascertained. This fine lake has evidently been caused by the subsiding of the ground, as it contains great numbers of trees still standing up in its waters. In its centre rises a small and very beautiful island. Its water is as deep a blue as the ocean, and the native name for it, "Te Moana," means "The Sea." The Maories believe that in the middle of Lake Taupo there is a whirlpool, inhabited by a "taniwha"—a gigantic kind of lizard, which seizes their canoes, whirls them round and round, and then devours them and their contents. There are quantities of small fish in the lake, which the natives catch, and cook in the convenient natural saucepans formed



A WONDERFUL VOLCANO, NEW ZEALAND.

by the hot springs near. They also use the steam and mud springs for stewing food. Visitors to this region always amuse themselves by cooking bacon, potatoes, and other vegetables, in these charming kitchens. On the south of Lake Taupo is the pretty village of Takanu, with a splendid waterfall near—three cascades, which come tumbling down rocks covered with woods and ferns. Some thirty or forty years ago, in this region, a whole village was buried ; the hot springs had loosened the hill-side, then came heavy rains, and an avalanche of mud swept down over the village, and buried it.

THE MARVELOUS HOT SPRINGS.

The most wonderful part of the lake region is round the great hot Lake Ratomahana, which you recognize at once by the clouds of white steam rising from it. Everywhere round the lake there is a seething, hissing, and boiling sound from the numerous escapes of steam, boiling water, or hot mud. Eighty feet above, on the fern-clad slope of a hill, there lies an immense boiling cauldron in a deep hollow with steep sides, full to the brim of perfectly transparent water, looking bright turquoise-blue in its white basin. The surplus water flowing down the hill-side has formed a pure white deposit in a series of stages, each terrace hung with stalactites, and inclosing basins of every size and depth, the upper warmer, and the lower cooler—exquisite and most picturesqe baths, the intense red of the bare earth walls contrasting with the blue of the water, the dazzling white of the basins, and the bright green vegetation round. The stone flooring does not cut the bather's feet in the least ; it is quite soft to the touch, and smooth, so that you can recline in your bath in the greatest comfort.

BREAD THAT GROWS ON TREES.

New Caledonia is no less than two hundred and forty miles long; it is very mountainous, and has rather a bleak, barren appearance. The red clay soil is less fertile than that of most of the South Sea Islands, which is, perhaps, the reason that the inhabitants are more industrious than most of their neighbors, and have cultivated the ground more.

The bread-fruit, which is the staff of life to the natives of these islands, is indigenous in New Caledonia, but does not grow in the same profusion as in most of them. The South Sea Islanders have a curious legend with reference to the origin of the bread-fruit. They say, that in the reign of a certain king, when the people ate red earth, a husband and wife had an only son of whom they were exceedingly fond. The boy was weak and delicate ; and one day the husband said to the wife: "I compassionate our son ; he is unable to eat the red earth I will die, and become food for our son." The wife naturally asked how he would become food ; and he explained that he had prayed to his god to help him, and had received a favorable answer. "When I am dead," he said, "take my body, separate it, and plant my head in one place, my heart in another, and so on. Then come into the house and wait. When you shall hear at first a sound like that of a leaf, then of a flower, afterwards of an unripe fruit, and at last of a ripe, round fruit falling on to the ground, know that it is I who am become food for our son." He died soon after, and his wife obeyed his directions. After a while she heard a leaf fall, then the large scales of the flower, then a small, unripe fruit, afterwards one full-grown and ripe. This was in the night. When daylight came, she woke her son and took him out, and they beheld a large and handsome tree covered with broad, shining leaves, and loaded with bread-fruit.

PREPARING THE FRUIT FOR THE TABLE.

The bread-fruit tree is certainly a most beautiful and wonderful one. The trunk, which is covered with a light-colored, rough bark, sometimes measures two or three feet round, and rises from twelve to twenty feet before the branches shoot out. Their form is very graceful, and the leaves are large, broad, and thick, of a dark-green color, with a surface as glossy as the most shiny evergreen. The fruit is sometimes round and sometimes oval; about six inches in diameter, and covered with rough rind, marked into lozenge-shaped divisions, rising in the middle. It is at first a light pea-green color, then it changes to brown, and when fully ripe becomes a rich yellow. The fruit hangs to the small branches of the trees by a short, thick stalk, either singly or in clusters. The flower is nothing particular. The fruit is never eaten raw, except by the pigs; and the natives have several ways of dressing it. When traveling, they often simply roast it in the flame or ashes of a wood fire, then they peel off the rind and eat the pulp. Sometimes they plunge it, when cooked in this way, into the water, and when soaked it becomes a sweet, spongy paste, of which the natives are very fond. The usual way of cooking it, however, and the best, is by baking it in an oven of heated stones. The rind is taken off and the fruit cut in slices, a layer of leaves is placed over the hot stones, and the fruit laid on it, another layer of leaves over the fruit, and hot stones on the top of them. The whole is then covered with earth and leaves, several inches in depth. In about half an hour the fruit is taken out nicely browned on the outside, the inside looking rather like the crumb of a white loaf. Plantains, sugar-canes, and cocoa-nuts also grow in New Caledonia, but in no great abundance. The natives cultivate them, as well as yams, with skill and care. There are plenty of fish on the coast, plenty of turtles, and a great variety of birds, some peculiar to the island; but quadrupeds seem almost unknown. There are no names for dogs, cats, or goats.

The natives are a tall, well-proportioned race of men. They have very frizzly hair, which is sometimes tied in a bunch on the top of the head, sometimes in two bunches, one on each side of the head, and very often cut short all round like a frizzly mop. The chiefs wear a sort of turban-like cap. The men wear scarcely any clothing, the women have a kind of petticoat.

Captain Cook, who was one of their earliest visitors, if not quite the first, gave them an excellent character. He described them as being most courteous and friendly, and not at all addicted to pilfering. He and his party were guided and accompanied in their excursions by natives who showed not the least fear of the white men, and never the slightest sign of hostility. Subsequent visitors to the island were not nearly so fortunate in their reception, but perhaps they did not understand so well how to manage the natives. Captain Cook had so much experience in making acquaintance with savages, and such a warm heart and genuine feeling of interest in them and honest wish for their welfare, that he generally succeeded in inspiring them with confidence and gaining their good-will. His death at last, at the hands of the Sandwich Islanders, was, as it were, from an accident; though a most sad one. Unprincipled traders, too, constantly removed the friendly feeling Captain Cook had established, and then, though they might themselves escape, woe to the next party who might visit the spot!

CHIEFS WHO CAN PUT THEIR SUBJECTS TO DEATH.

The New Caledonians are great fishermen, for, owing to the unproductiveness of their land, they have to depend on what they can catch as their principal means of subsistence. There is a kind of small fish something like a sardine, which comes in large shoals, on which the natives live a great deal. In the small rivers they catch eels and crayfish. Mullet are abundant, and on the beach plenty of shell-fish and molluscs of various kinds are to be found. The chiefs of New Caledonia are very great people: the natives approach them in a crouching position, and they have the power of life and death absolutely in their hands. They are very superior to the common people. Their gods are their ancestors, whose relics they preserve very carefully, and they pray to these gods before doing anything of importance—fighting, fishing, planting, or even feasting.

The spirits of those who die are supposed to go into the bush, and at certain periods of the year they have feasts in which they prepare heaps of food for them. They used to think the white men were the spirits of the dead, and brought sickness, and gave this as a reason for killing them. They have quite given up this idea now, but it is too true that the Europeans brought them many diseases of which they had never heard before. On the death of a chief there are grand ceremonies of feasting and lamenting, and elaborate tombs are erected for them which are always kept sacred, and regarded with great veneration.

A PECULIAR KIND OF DANCE.

The principal amusement here, as in most of the Pacific Islands, is dancing. There is one very peculiar performance called the "pilou pilou." A party of travelers had paid a visit to the island, and were about to leave it, when they were dreadfully alarmed by seeing a long file of natives approaching, armed, tattooed and blackened, and brandishing their hatchets, their clubs, and their redoubtable lances; they came nearer and nearer, and at last placed themselves before the Frenchmen. At the same time two men seated themselves on the turf opposite the troops of warriors, one holding a flute and the other a hollow bamboo, upon which they began to play. The travelers at once recognized the festival sound, and their fears disappeared. It was a "pilou pilou," which the chief of the district was offering in their honor on the occasion of their departure. The principal attraction of the performance was a native ornamented with the New Caledonia mask. This is a frightful gigantic head of wood, at the mouth of which the man who wears it looks out. Human hair makes a great wig for it, and its lower part is surrounded by a net covered with birds' feathers. The native honored with the wearing of this advanced towards the spectators from the sea-shore by way of allusion to their arrival in the island. He danced a long time before his comrades, who accompanied him, brandishing their spears above his head, agitating their arms in time, and making a sort of panting whistle. After this exhibition the chief placed himself in front of the line, and made a sort of address to the departing guests, with long pauses now and then, during which the natives joined in an ear-piercing howl. The address was chiefly a series of good wishes and kind expressions to the Frenchmen, such as—"Our friends are going to leave us; they are going to set out to-morrow on the great sea. May the winds be favorable to them. May they find the sea calm and gentle, and arrive safe in port, after a pleasant voyage."

ISLANDS MADE OF CORAL.

About seventy miles from New Caledonia is a group of islands called the Loyalty Islands. They are formed of nothing but coral in an early stage of development, bare and broken ridges upheaved from the sea. Between them are pits filled with sufficient soil to cultivate cocoa-nut trees and yams, but the islands produce but a scanty sustenance for the inhabitants. Their chief-product is sandal-wood, which grows in abundance, and which brings the islands many visitors who trade with China in this article. Walking about the coral islands is dreadful work for visitors: their shoes get cut to pieces and their feet exceedingly sore. A traveler who paid several visits to these islands describes one terrible walk of twenty miles; he says that nothing but broken bottles equals jagged coral. The paths are such that you never take three steps in the same direction, and every minute trip against blocks of coral hidden by long leaves and weeds trailing over the path. Often for half a mile you have to jump from one bit of coral to another.

From the observations of various travelers, it is evident that the coast-scenery of New Guinea on the south and east everywhere presents the same general characteristics—immense breadths of low, swampy land, densely planted with mangroves; which, as the ground rises, gives way to thick and lofty forests, inhabited by lories, cockatoos, and pigeons. Here and there sandy flats, uncovered at low water, are utilized by the natives, and weirs for catching fish are constructed upon them. These are walls of loose stones, about three feet high, formed in curves and semicircles, each with a radius of one or two hundred yards. At high water they are completely covered; but when the tide falls numbers of fish are left within these inclosed spaces, or, together with crabs and other creatures of the sea, caught in the interstices of the stones. At varying distances from the shore stretches the great sunken barrier-reef of coral, which possesses so marked a resemblance to the Barrier Reef of Australia. The water upon the reef is generally very shallow; but at certain points deep gaps or channels occur, which ships of heavy burden may navigate with safety.

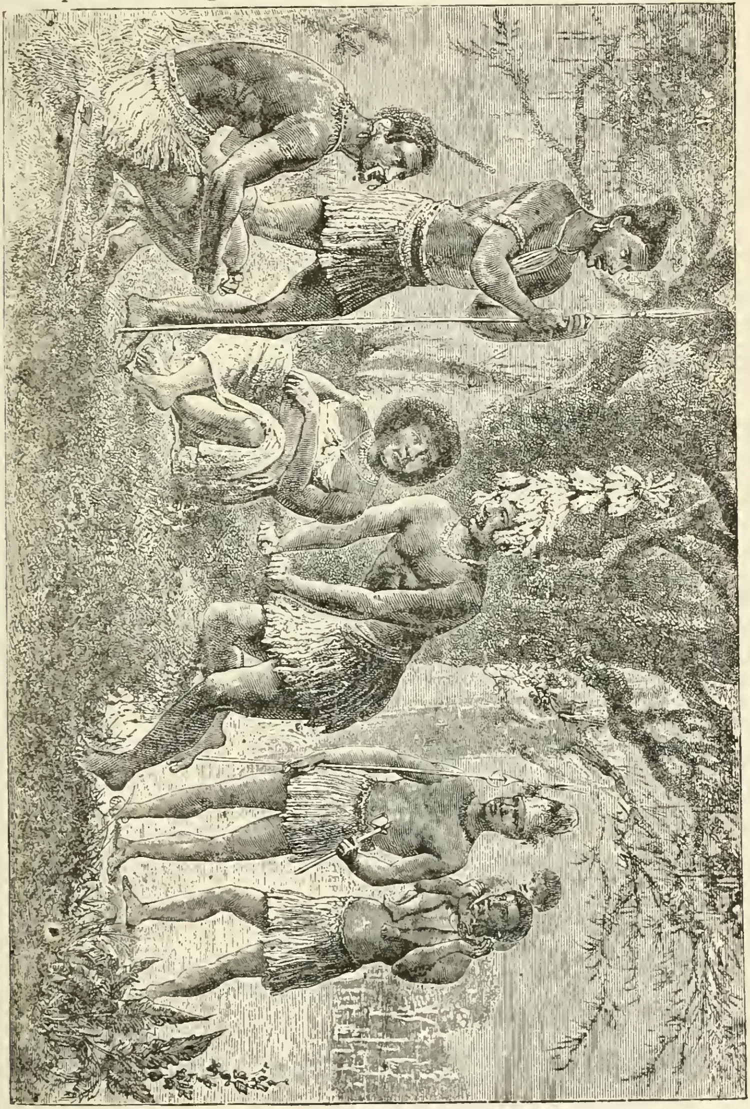
FONDNESS FOR THE TOBACCO PIPE.

Along the low littoral belt clearings have been made by the natives, to obtain sites for their little settlements. For this purpose a slight knoll or rising ground is selected. The timber-trees are then felled, the old stumps and branches of the trees being sometimes left for the "ketai" or yam plants to be trained upon. In the rear a grove of cocoa-nuts frequently affords shelter and precious food. The gardens are planted with plantains, and fenced in with the bamboos; beyond which spreads the tropical forest, matted by innumerable creepers and impervious with dense undergrowth. The construction of the huts is always on the same system: a flooring raised upon posts, a gabled roof, and walls and partitions of split bamboo. The great amusement of the inhabitants of these huts—apparently their only luxury—is tobacco-smoking, in which they indulge after a fashion of their own. They break off a piece from the roll or plait into which the leaves are twisted, and wrap it in a green leaf, to prevent it from igniting the bowl of their wooden pipe. A woman is deputed to fill the bamboo tube with smoke; after which it is passed round, and each person in turn inhales a long whiff, which he swallows, apparently with considerable effort—stands motionless a few seconds, as if paralyzed, with the tears in his eyes—then he respires deeply, and seems to recover. This practice the natives call "fire-drinking;" and objectionable as it seems to us, protest that it comforts and benefits them.

Their principal occupations are hunting, fishing, and manufacturing images, tortoise-shell masks, drums, and bows and arrows. The bows are made of the upper part of a stout bamboo, partly split in half, flattened, and bent by the application of heat. The string is a broad strip of the tough outer rind of a bamboo; and the fastenings are ingeniously and powerfully wrought. The bows are large, and of great strength; some are more than seven feet long, and in the centre more than three inches wide, and an inch thick. The natives discharge their arrows to very considerable distances, but not with any great accuracy of aim. The arrows vary from three to five feet in length, the common sorts being pointed only with hard wood, variously jagged and barbed. The war arrows, however, are much larger and heavier; the hard-wood part being very thick and square, and elaborately carved, with a sharp bone point and barb made and fitted like the Australian spears. The shaft is always a light cane or reed, without feathers. In using the bow, the men wear on the left arm a stout armlet or gauntlet, which reaches from the hand to the elbow, is made of woven grass, and serves to defend the arm from the rebound of the string, thus preventing the injury that otherwise would result.

PHYSICAL CHARACTERISTICS OF THE NATIVES.

A few words may be added in reference to the physical character of the natives, which will apply to all the Papuans, whether inhabitants of New Guinea or of the islands that fringe its shores. The men, generally speaking, are fine, active, well-made fellows—such is the description of a modern voyager—rather above the middle height, and of a dark brown or chocolate color. Sometimes their faces may be designated handsome; they have aquiline noses, rather broad about the nostrils; well-shaped heads, and, in not a few cases, a curiously Hebrew cast of features. The frizzled hair is worn in long pipe-like ringlets, smeared sometimes with red ochre, sometimes left in its natural black color; the use of wigs is not infrequent. The cartilage of the nose is bored, and occasionally something is worn in it. Their ears are generally pierced all round with small holes, in which pieces of grass are stuck; and in many the lobe is torn, and hangs down to the shoulder. On the body and limbs the hair grows in small tufts, so that the skin has a slightly woolly appearance. They go entirely naked, except so far as some slight covering is afforded by the ornaments they wear; these are made of mother-of-pearl shells, either circular or crescent-shaped, suspended round their necks. Occasionally, also, part of a large shell, apparently a helmet-shell, is cut into the shape of a shield, and worn in front of the groin, a very good protection, although we would call it a singular kind of garment.



A GROUP OF NATIVES OF NEW GUINEA.

The dress of the women consists of one or two nessoors, or petticoats, round the waist, and reaching nearly to the knees. These are composed of the inside part of the large leaves of a bulbous-rooted plant, called "teggaer," of which each strip measures an inch in breadth. The nessoor of the young girls is made of much narrower strips, from the inside of the leaf of the "cabbow" or plantain. They are sown on to a girdle. The younger women are often gracefully formed, with agreeable expressions of countenance, though not what Europeans would consider handsome features. They quickly degenerate, however, as is the case with women in all savage races; the degeneracy arising from insufficient food, and hard labor. The girls wear their hair rather long, but the women cut their tresses short, with a bushy ridge over the top. Some of the elder females shave their heads quite smoothly; and they never wear a wig, or dress their hair in long ringlets, like the men. This gives them a bold appearance.

HORRIBLE PRACTICES AMONG THE FIJIANS.

The Fijians are, or were till very lately, a most savage and degraded race. It is only quite recently that the practice of cannibalism in all its most horrid forms has been given up by them; indeed, in some of the islands it is still practiced, but the natives are now, generally speaking, ashamed of ever having allowed it. When, by King Thakombau, the islands were taken under the protection of Queen Victoria, he sent her as a present a club he valued greatly, with which he had in former days killed no less than three hundred persons, whom he had afterwards eaten. This club, which was made of some very dark wood, he sent to Sydney to be decorated before it went to England. It was beautifully ornamented with silver fern-leaves, and was exhibited in a shop window for some time as a work of art. Another dreadful custom besides the cannibalism is not yet entirely given up by the Fijians: that of burying each other alive, for all sorts of trifling reasons; generally speaking, however, with the consent of the party to be buried. In one of the small islands an old man insisted on being buried alive, because he said that one of his sons had not saluted him in the morning with the usual reverence, which showed that he was getting too old, and losing respect, and he would rather be buried out of the way.

There is a well-authenticated account of a young man who chose to be buried alive because he was growing thin, and was afraid the girls would laugh at him. His father and other members of the family assisted in the ceremony quite cheerfully. This story is told by a sailor of the name of John Jackson, who lived among the Fijians for two years, being detained by force. He learned their language, and they were on the whole good-natured to him, though he often had to escape from one tribe to another when he had happened to offend those he was among. Once he very narrowly escaped with his life.

The Fijians have a great variety of gods, most of whom they seem to consider very like themselves in their tastes and habits. One is supposed to be very fond of turtles, one of human brains. At Nateva, where Jackson lived for some time, there was a temple where the people used to lay various offerings for the use of their gods, roast pigs and muskets among them. On one occasion there was a grand roasting of and feasting on pigs, but Jackson did not consider that he had had his share. Being very hungry in the night, he came to the conclusion that it was much better that he should have a good supper than that the pork should be wasted on his friends' false gods, so he stole into the temple, where he knew the pigs lay, and made a meal off a portion of a small one. When he had finished, he remembered that he had not cut the pig in the same way as the Fijians, and that he would be sure to be found out, so he threw the remainder of the animal into the bush for the dogs to eat. The natives were all extremely puzzled when they found a whole pig had disappeared, but at length they came to the conclusion that one of their favorite gods had swallowed the pig whole. An old priest informed them that Kalau leka (short god) had condescended to appear to him in the night in a state of high good-humor, and had informed him of various favorable events, and thus it was quite evident that his amiability was caused by his having swallowed the whole pig, as when he was hungry he was always unpleasant. The people were all quite satisfied with this story, and boasted so much of the cleverness of their short god in swallowing a pig whole that Jackson was sorely tempted to undeceive them. He refrained, however, for some time, for fear of evil consequences, but at length, when he had become more intimate and friendly with the people, he thought he might venture to tell them the story, thinking it would shake their faith in their ridiculous gods. At first they would not believe him, but when he pointed out the spot where he had thrown the pig, and its bones were found there, they were furious, and he had to run and swim for his life, escaping as best he could from the offended savages.

WEIRD DANCES AMONG THE FIJIANS.

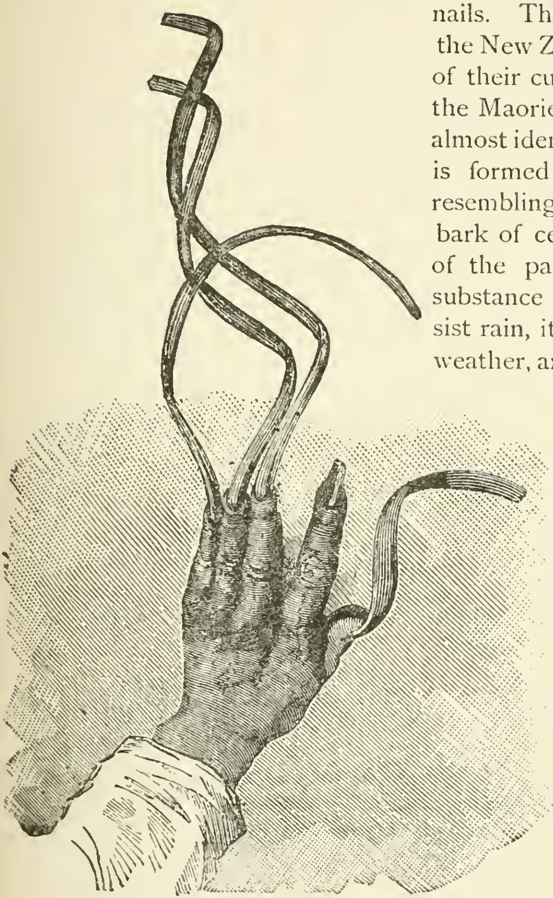
After supper there is always a grand native dance to amuse the king, in front of the palace, an immense fire being lighted, so that the performance may be seen distinctly. These native dances are most strange and wild affairs. The dancers form a circle, and utter a loud shout; they then begin to dance, quietly enough at first, but gradually quicken their movements, each man trying to outdo his companions in the strangeness and grotesqueness of his attitudes, twisting his body, arms, and legs about in apparently the wildest manner, but however excited they become the performers always act in concert, and the dance is as regularly carried out as a Highland reel. Sometimes they career round and round the fire, crouching on the ground one moment, and then starting up brandishing a spear or club the next, and shouting a sort of wild song all the time.

Sometimes girls and women perform dances most gracefully, for they have beautiful figures, and are wonderfully light and agile in their movements. They wear short dresses, made from the bark of trees and dyed all sorts of colors, and shell necklaces, and on their hair, which is always frizzed out into as big a mop as possible, a wreath of flowers. The elaborate way in which the Fijians arrange their hair is supposed to have been the cause of the strange sort of pillow in use among them. This is simply a straight piece of wood, with two little feet to raise it. It is made either of bamboo or hard wood, and is of course miserably uncomfortable to a stranger at first, but some people get accustomed to it, and find it much better than no pillow at all.

PRIDE OF THE NATIVES IN GIVING MONEY.

There is a curious account of a visit to a village on a grand Christian native festival-day, the occasion of the collection of native contributions to the Missionary Society. The little town was full of visitors, every one dressed in his best. The dancing-green, in front of the chief's house, was cleared, and a white flag hoisted in the middle. About eighty young men danced the club dance and the fan dance. They wore fringes hanging round their waists, generally a combination of red and yellow Pandanus leaf (a sort of pine) cut in strips, and black, fibrous girdles of fungus. All their bodies were smeared with cocoa-nut oil. After the first dance, a missionary arrived with three native teachers. A table was set out under a tree opposite the chief's house, and they stood behind it to receive the money. Each man and woman marched up in turn, and threw their money on it, with as loud a rattle as possible. Only silver coins were brought, and the people preferred bringing two sixpences instead of a shilling, because they would make more jingle. They were evidently delighted and proud to make their offerings, and about five hundred dollars were collected. After the collection another party danced; this time the men and boys were painted in all sorts of ways, with three colors, red, white and blue. Some had one-half of the face red, and the other half blue; some had the face red, and body black. Some were spotted with red and blue; some had black spectacles round the eyes, and so on. They wore turbans, and plumes of red feathers in their hair, which waved and shook as they danced; and round their necks pearl oyster-shells set in whales' teeth.

The natives of Tahiti are tall and well made; the color of their skin is not very dark, and their hair, though generally black, is sometimes red or flaxen: it is always frizzed. They have large mouths, flat noses, and very white, even teeth. The women keep their skin beautifully soft by constant use of the cocoa-nut oil. They wear their hair short. The chiefs are distinguished, like the Chinese mandarins, by very long nails. They are all tattooed like the New Zealanders; indeed, many of their customs are like those of the Maories, and their language is almost identical. The native dress is formed of a kind of cloth, resembling paper, made from the bark of certain trees, particularly of the paper-mulberry. As this substance is not well suited to resist rain, it is thrown aside in wet weather, and a sort of matting used instead. The form of the dress is two pieces, one wrapped round the waist; the other with a hole in the middle, for the head to go through, hangs from the shoulders. Sometimes the dresses are highly ornamented. Both men and women are fond of wearing flowers in their hair.



A TAHITIAN CHIEF'S FINGER-NAILS.

On the occasion of one of the visits of an English ship to Tahiti, the queen came on board, most elegantly attired. She wore a light, loose, flowing dress of white native cloth, tastefully fastened on the left shoulder, and reaching to the ankle. On her head was a pretty bonnet, made of green and yellow cocoa-nut leaves; each ear was pierced in several places, in which fragrant flowers from the Cape Jessamine were fastened. The old priest, who was very attentive to her wore a glazed hat, and a black coat, fringed round the edges with red feathers, and appeared to be proud of his finery.

The food of the common people is almost entirely vegetable. It consists of the bread-fruit, bananas, yams, apples, and a sort of sour fruit, used to flavor the roasted bread-fruit. The most general dish is "popoi," made of the coarse mountain plantain, beaten up to a paste with cocoa-nut milk. No less than thirteen different kinds of bananas grow in the island. The only quadrupeds (as in New Zealand) are dogs, pigs and rats. As the dogs are fed entirely on vegetable food, they are said to be very good to eat—something like lamb.

There are plenty of birds, wild ducks, green turtle-doves, large pigeons, small parrots, kingfishers, cuckoos, and herons. In the forests are many kinds of sweet-voiced singing birds. There are no snakes, but among the fish with which the sea-coast abounds, a poisonous kind of sea-snake is sometimes found, whose bite is said to be mortal. The climate of the island, which is deliciously warm, and at the same time quite healthy, makes houses almost unnecessary, and the natives build little shelters, in very light and airy fashion. They are merely a sort of shed, like the roof of a barn, supported by three rows of pillars. The thatch is palm-leaves, and the floor is strewn with hay, and covered with mats. Under these the natives generally sleep, but they eat and pass the day in the open air. They go to bed about an hour after dark, and use a kind of oily nut, stuck upon a piece of wood, for a candle. The mats in their houses are woven in a wonderfully clever and dexterous manner, of rushes, grass and the bark of trees. They also make very nice baskets, and ropes, and lines, from the bark of a tree, and thread from the fibre of the cocoa-nut. Fishing-lines are made from a kind of nettle, nets of a coarse sort of grass, and hooks from mother-of-pearl. Their tools are stone hatchets, a chisel, generally made from the bone of a man's arm, and a rasp made of coral, or the skin of a poisonous fish, called a sting-ray. All these articles of native manufacture are, however, becoming rare in these days, as they have been entirely superseded by European introductions, for which the Tahitians show the greatest eagerness. Indeed, it does not appear that their warm reception of missionaries arose from any desire for religious instruction. They very soon began to complain that the missionaries gave them plenty of talk and prayer, but very few knives, axes, scissors or cloth. However, these were soon after amply supplied.

A traveler gives a delightful account of his arrival in Tahiti, and of the state of things he found there. He describes the enchanting beauty of the island as he entered the Matavai Bay, with its broken, stupendous mountains, and rocky precipices, clothed with every variety of verdure, from the moss of the jutting promontories on the shore, to the deep and rich foliage of the bread-fruit tree, the oriental luxuriance of the tropical pandanus, or the waving plumes of the lofty and graceful cocoa-nut grove. The scene was enlivened by the waterfall on the mountain's side, the cataract that chafed along its rocky bed in the recesses of the ravine, or the stream that slowly wound its way through the cultivated and fertile valleys, fringing the banks with the most delicate verdure.

NEARLY CRAZED AT THE SIGHT OF A HORSE.

The natives soon came on board to welcome him, including the king, who was delighted with some cattle which he had brought from Australia, and especially with a horse which was given him, the first that had ever been seen in Tahiti, and whose appearance caused the utmost excitement. The poor animal, which had been hung in slings and unable to lie down during the chief part of the voyage, was hoisted out of the hold to be taken on shore in a large pair of canoes, which the king had ordered for the purpose. While the horse was suspended during the transition, some of the bandages gave way, and he slipped through the slings and fell into the sea! He instantly rose to the surface, and swam, snorting, towards the shore. As soon as the natives saw this, they plunged into the water and followed him like a shoal of porpoises, seizing his mane and tail, and nearly drowning the poor animal in spite of the king's shouts to leave him alone. However, he managed to gain the beach, and as he rose out of the water, the natives on the shore fled in the utmost fright, climbing the trees, and crouching behind the rocks and bushes for safety. The next morning, crowds assembled to see the captain of the ship mount the horse, with which sight the natives were delighted. They called the horse "a man-carrying pig," unable to give it any more appropriate name.

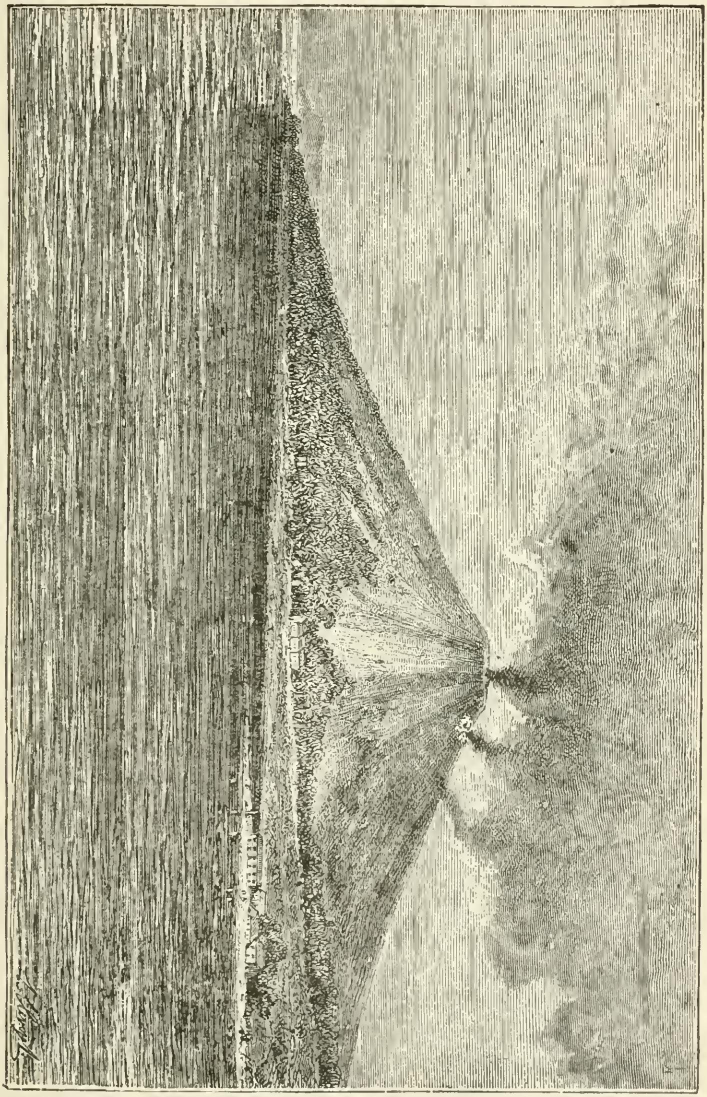
THE RENOWNED SANDWICH ISLANDS.

The Sandwich Islands are the only important group in the North Pacific Ocean. They are completely isolated, being two thousand three hundred and fifty miles from San Francisco, the nearest part of the American coast, and about the same distance from the coast of Japan, from the Marquesas and the Samo Islands to the south, and from the Aleutian Islands a little west of north. They are only connected with the other Pacific islands by bare coral reefs, the nearest of which is about seven hundred miles off. This very central position in mid-ocean, where they are, as it were, a stepping-stone between two worlds, gives the Sandwich Islands much political and commercial importance, and as a place of rest and refreshment for the large fleet of whalers in the Northern Pacific, they are of great value. But besides their advantages of situation, these Sandwich Islands are in themselves most attractive. All travelers agree in their descriptions of their delights. All the beauties and enjoyments of the summer island-world seem concentrated in them, without its frequent drawbacks. The group consists of seven large islands, all inhabited, and four rocky islets. Hawaii, the largest of the group, is seventy miles across. Hilo, the principal town in Hawaii, is one of the most delightful places in the world. This crescent-shaped bay, said to be the most beautiful in the Pacific, is fringed with cocoa-nut and palm trees, and the town beyond looks from the sea like one mass of greenery, for the white houses are half-buried in the rich, luxuriant vegetation. It is said that if a shower falls anywhere in the Pacific Ocean it may be traced to Hilo; and these continual rainfalls keep the grass, and the trees, and the creepers dazzlingly green, and fill the streams which come leaping down the rocks in endless cascades, while the rich soil, and the heat, and the sunshine combine to make the whole place a garden. Over all tower the two great volcanic mountains, Mauna Kea and Mauna Loa, crowned with almost perpetual snow, which a traveler describes in this way: "Mauna Kea from Hilo has a shapely aspect, for its top is broken into peaks, said to be the craters of extinct volcanoes; but my eyes seek the dome-like curve of Mauna Loa with far deeper interest, for it is as yet an unfinished mountain. It has a huge crater on its summit eight hundred feet in depth, and a pit of unresting fire on its side; it throbs, rumbles, and palpitates; it has sent forth floods of fire over all this part of Hawaii, and at any moment it may be crowned with a lovely light, showing that its tremendous forces are again in activity."

In olden times the Hawaiians believed that in this terrible abode dwelt their great goddess "Pélé," who sported with her attendant demons among the sulphurous waves. There is a curious deposit found in the crevices of the vast lava-hill below the crater, which is still called "Pélé's hair." It is of a yellowish-brown color, like coarse spun glass. During an eruption, when the fire-fountains play to a great height, and the lava is thrown about in all directions, the wind catches it and blows it out in long thin threads, which stick to projecting points, and thus this curious-looking substance is formed.

AN ISLAND THAT SHAKES.

There have been many terrible earthquakes in Hawaii, some of which are remembered by the present inhabitants. In 1868 a series of earthquakes began in the month of March, becoming more frequent and startling from day to day, till, as one lady aptly expressed it, the island quivered like the lid of a boiling pot nearly all the time between the heavier shocks. The trembling was like that of a ship struck by a heavy wave. This state of things lasted for a week, and then came the climax on a lovely April day. The crust of the earth rose and sank like the sea in a storm; rocks were rent, mountains fell, buildings and their contents were shattered, trees swayed like reeds, animals were scared, and ran about demented; men thought that the Judgment had come. The earth opened in thousands of places, the roads in Hilo cracked open, horses and their riders and people afoot were thrown violently to the ground; it seemed as if the rocky ribs of the mountains and the granite walls and pillars of the earth were breaking up. At Kilauea the shocks were as frequent as the ticking of a watch. In Kau, south of Hilo, there were three hundred shocks in one day. An avalanche of red earth burst from the mountain-side, throwing rocks



THE GRAND MAUNA LOA IN ACTION.

high into the air, swallowing up houses, trees, men and animals; and traveling three miles in as many minutes, burying a hamlet, with thirty-one inhabitants and five hundred cattle. The people of the valleys fled to the mountains, which themselves were splitting in all directions; and collecting on an elevated spot, with the earth reeling under them, they spent the night in prayer and singing. Looking towards the shore, they saw it sink, and at the same moment a wave, whose height was estimated at from forty to sixty feet, hurled itself upon the coast and receded five times, destroying whole villages, and even strong stone houses with a touch, engulfing forever forty-six people who had lingered too near the shore. After this awful day, the earthquakes still continued, and people putting their ears to the ground fancied they could hear the imprisoned lava sea rushing below. At length, after traveling under ground for twenty miles, it burst forth with tremendous force and fury. Four huge fountains boiled up, throwing crimson lava, and rocks weighing many tons, to a height of one thousand feet. A gentleman, who was near the spot at the time, described the scene in these words: "From these great fountains to the sea flowed a rapid stream of red lava, rolling, rushing, and tumbling, like a swollen river, bearing along in its current large rocks, that made the lava foam as it dashed down the precipice, and through the valley into the sea, surging and roaring throughout its length like a cataract, with a power and force perfectly indescribable. It was nothing less than a river of fire, eight hundred feet wide, and twenty deep, with a speed varying from ten to twenty-five mile an hour." These descriptions are terrible enough. Considering the awful nature of the volcanic eruptions and earthquakes in Hawaii, however, the destruction of human life does not seem to have been so great as one would have feared would be the case. There were many marvelous escapes from impending death.

DEATH OF THE CELEBRATED CAPTAIN COOK.

It was at Hawaii that our great navigator, Captain Cook, met with his death—a circumstance as much deplored by the Sandwich Islanders of the present day as by his own countrymen. To Captain Cook is accorded the honor of having discovered these islands, but there are native traditions of much earlier white visitors, and there is no doubt that Spanish navigators landed there in the sixteenth century. However, our first authentic information about them was brought by Captain Cook, who, with his two ships, the "Resolution" and "Discovery," approached the two most westerly of the islands in January, 1778. Great was the amazement of the first natives who went to examine the ships at what they saw. In those days English seamen used to wear cocked hats; these the Sandwich Islanders thought were a part of their heads, and they described the visitors as having heads " horned like the moon." They stated, moreover, that they had fires burning at their mouths—no doubt meaning cigars—and that they took anything they wanted out of their bodies : such was the idea conveyed by the civilized institution of pockets. All these circumstances, combined with the strange language of the new-comers and the firing of some guns, made the natives come to the conclusion that their visitors were certainly gods. There was a belief in the islands at that time that a certain much-honored god called " Lono " had sailed away in a fit of jealousy and a triangular canoe, having first prophesied that he would return in after times on an island bearing cocoa-nut trees, swine and dogs. Captain Cook's ships, so much larger than their own canoes, and with tall masts, now appeared to the natives like floating islands with trees on them, and they made sure that " Lono " was returning to his own country. When Captain Cook landed, they came to the conclusion that he must be the great god himself. They prostrated themselves before him, and brought everything they could collect in the way of food as offerings. Captain Cook does not seem to have discouraged the idea that he was a god. He felt that it insured the safety of himself and his crew, and for a fortnight the ships remained at the islands, all living in clover. Then they sailed away.

Early the following year they returned, and Captain Cook landed, confident of another welcome, on the western side of Hawaii. Here, his fame having spread from island to island, he was again received with divine honors, all the offerings the natives were accustomed to make to their gods being brought to him. The king visited him, and threw over him his own cloak, and presented him with pigs and fruit, concluding the interview by changing names with him—a ceremony which was considered the greatest possible sign of friendship and respect. For a time all went well, as before, but gradually doubts of the divine origin of the visitors began to rise in the native mind. One of them died and was buried : this showed him to be only mortal, like themselves. They began to grudge the supplies for the ships which they had to produce. A quarrel arose between the natives and the seamen, and some of the latter were pelted with stones. Soon after this the ships set sail ; they were becalmed within sight of land for a day, and the king sent on board a parting present of pigs and vegetables. All might now have been well, but unhappily the ships encountered a heavy gale, and put back a week later into the Bay of Kealakeakua for repairs, and this time the welcome received by the Englishmen was not nearly as warm as before. Soon some thefts were committed by natives visiting the ships, who could no longer resist stealing pieces of iron, for which the Pacific islanders in those days craved far more than for gold. Then some shots were fired from the "Discovery" at a canoe. This quarrel was nominally made up, but soon after one of the "Discovery's" cutters moored to a buoy was stolen by a chief. Captain Cook was determined that this boat should be restored, and, trusting to the veneration in which he was held, he went on shore, with the intention of bringing the king back with him, and keeping him as a hostage till the stolen property, so valuable to him, should be given back. The king, it appears, would have consented to this plan, and walked to the shore with Captain Cook; but the islanders would not submit to what they considered not only a great indignity but a great risk. They surrounded the king, and protested against his going on board the ships. His wife, too, entreated him to stay.

While the king hesitated, there came a cry that the foreigners had fired at a canoe and killed a chief. Then the natives began to arm themselves with clubs, stones and spears. The king sat down, and Captain Cook walked towards his boat. As he walked, a native attacked him with a spear, and Captain Cook turned and shot him with his double-barreled gun. Stones were then thrown, and the sailors in the boats, seeing this, fired on the people. Captain Cook tried to stop this, but the noise was so great that he could not make himself understood; and meanwhile a chief approached from behind and stabbed him in the back. Captain Cook fell into the water, and never spoke again. This is the English account of the death of the great navigator, as handed down from Captain King, his companion. The native account differs little from it, except in stating that the warrior-chief who attacked Captain Cook had no intention of killing him, still believing him to be the god "Lono" and immortal, but that, being struck, he gave a cry or groan, which dispelled the belief in his divinity, and the chief therefore killed him. The remains of Captain Cook were subsequently restored to his friends, and he was buried at sea—with what sad and awe-stricken feelings one can well imagine—and the exploring ships sailed away from the bay without the guiding spirit which had brought them there. The work of the great navigator was done, and he lay at rest in the bosom of the mighty ocean whose mysteries he had so long loved to unravel. The fame of his adventures has filled the world.

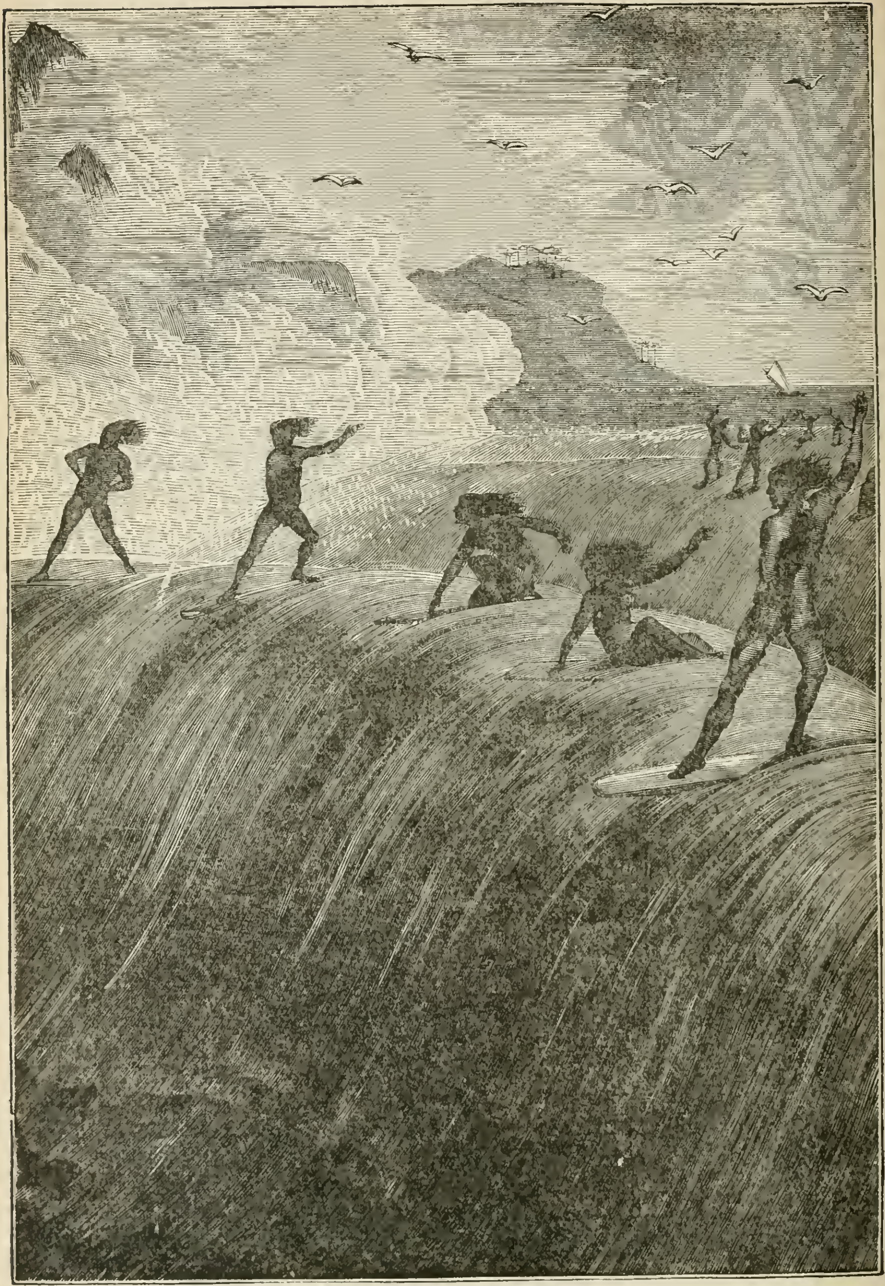
For nearly a hundred years after Captain Cook's death the spot where he fell was only marked by a cocoa-nut stump set up on a bed of stones and broken lava, on which different visitors fixed sheets of copper with simple inscriptions recording the event. Within the last few years, however, a more suitable monument has been erected by some of his fellow-countrymen.

Chief among the amusements of the islanders is the sport of surf-swimming. This is practiced in several of the islands of Polynesia, but in none is it carried out to such perfection as in the Sandwich group. The following spirited account of this sport is given in Captain Cook's Voyages:—Swimming is not only a necessary art, in which both the men and women are more expert than any people we had hitherto seen, but a favorite diversion amongst them. One particular mode in which they sometimes amused themselves with this exercise in Karakakooa Bay, appeared to us most perilous and extraordinary, and well deserving a distinct relation. The surf, which breaks on the coast round the bay, extends to the distance of about one hundred and fifty yards from the shore, within which space the surges of the sea, accumulating from the shallowness of the water, are dashed against the beach with prodigious violence. Whenever from stormy weather, or any extraordinary swell at sea, the impetuosity of the surf is increased to its utmost height, they choose that time for this most exhilarating amusement.

A MARVELOUS MODE OF SWIMMING.

Twenty or thirty of the natives, taking each a long, narrow board, rounded at the ends, set out together from the shore. The first wave they meet they plunge under, and suffering it to roll over them, rise again beyond it, and make the best of their way by swimming out into the sea. The second wave is encountered in the same manner with the first; the great difficulty consisting in seizing the proper moment of diving under it, which, if missed, the person is caught by the surf, and driven back again with great violence; and all his dexterity is then required to prevent himself from being dashed against the rocks. As soon as they have gained, by these repeated efforts, the smooth water beyond the surf, they lay themselves at length on their board, and prepare for their return. As the surf consists of a number of waves, of which every third is remarked to be always much larger than the others, and to flow higher on the shore, the rest breaking in the intermediate space, their first object is to place themselves on the summit of the largest surge, by which they are driven along with amazing rapidity toward the shore.

If by mistake they should place themselves on one of the smaller waves, which breaks up before they reach the land, or should not be able to keep their plank in a proper direction on the top of the swell, they are left exposed to the fury of the next, and, to avoid it, are obliged again to dive and regain the place from which they set out. Those who succeed in their object of reaching the shore have still the greatest danger to encounter. The coast being guarded by a chain of rocks, with here and there a small opening between them, they are obliged to



EXTRAORDINARY FEATS OF SURF SWIMMING BY SANDWICH ISLANDERS.

steer their board through one of these, or, in case of failure, to quit it before they reach the rocks, and plunging under the wave, make the best of their way back again. This is reckoned very disgraceful, and is also attended with the loss of the board, which I have often seen, with great terror, dashed to pieces at the very moment the islander quitted it. The boldness and address with which we saw them perform these difficult and dangerous manœuvres was altogether astonishing, and is scarcely to be credited.

These swimmers used often to pass nearly a mile seaward, in order to enjoy the rapid motion of their return as long as possible. Both sexes and all ranks unite in it, and even the very chiefs themselves, who have attained to the corpulency which they so much admire, join in the game of surf-swimming with the meanest of their subjects. Some of the performers attain to a wonderful degree of skill, and not content with lying on the board, sit, kneel, and even stand on it as they are hurled shoreward by the giant waves. The boards are of various sizes, according to the age and stature of the owner. For adults they are about six feet in length. They are slightly convex on both sides, and are kept very smooth—all surf-swimmers cherishing a pride in the condition of their boards, and taking care to keep them well polished and continually rubbed with cocoa-nut oil.

A ROCK-BOUND ISLAND.

Pitcairn's Island, which is only about six miles long and three broad, looks like a mere speck in the vast Pacific Ocean. It is completely iron-bound with rocky shores, and landing there in boats is always difficult, though it is safe to approach within a short distance in a ship. The water is extraordinarily deep close to its very shores, and it is impossible for ships to anchor there. But within the rocky precipices round the coast are lovely valleys with palm forests, and groves of cocoa-nut trees, and bread-fruit, and the climate is delicious and the soil rich. It is one of the Edens of the Pacific Ocean.

The idols of these people are very rough, clumsy things, and though they believe them to have great power, they do not always treat them with much respect. The Typees, one of the tribes, had a baby god, of whom they thought a great deal, called Moa Atua; it looked like a bit of a broken war club with a rough human head carved at one end, and was swathed round in scarlet and white tapa, and carried in the arms of the chief priest. This is the curious ceremony they go through. The priest caresses and dandles Moa Atua, and whispers in its ear; when it makes no answer he appears to get provoked, and bawls to it; no answer being vouchsafed still, he gets apparently very angry indeed, strips the baby god of its finery, and buries it in a hole. By-and-bye he takes it out again, whispers once more, and then informs the bystanders of various interesting communications which it has made to him, and which they firmly believe. It is believed that if Moa Atua were so minded, he could cause a cocoa-nut to sprout out of his head, and that it would be the easiest thing in the world for him to take the whole island in his mouth, and dive to the bottom of the sea with it.

FINE SPORT IN THE WATER.

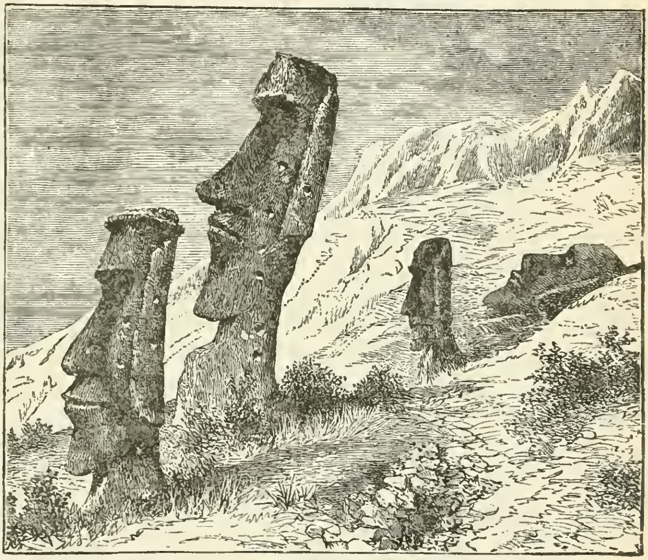
All the natives of the Marquesas Islands are splendid swimmers, and pass a great deal of their time in the water, splashing and diving about. Among the Typees canoes were tabooed to women, so if they wanted to get from one place to another, they were forced to swim. The mothers put their babies into the water soon after they are born, and let go of them for a minute or two at a time, and by being launched in this manner, like little ducks, they soon swim of their own accord. Of course, the water is very nice and warm in this part of the world, so that it is only like being put into a large warm bath, which babies always like, and not at all the same thing as being plunged into the cold rough sea. They may be said to grow up in the water.

Easter Island is a very remote and rather dreary little island, some thirty or forty miles round. It is so named, because it lies eastward of all the islands of the South Pacific Ocean. Pitcairn is its nearest neighbor of any consequence. It has a stony and hilly surface, and an iron-bound shore. At the south of the island there is an extinct volcano, and the hills seem to be chiefly formed of lava. There is no safe anchorage at Easter Island, no wood for fuel, no fresh water, and no domestic animals, except a few fowls. The inhabitants live on yams, potatoes, and sugar-cane, the soil being so exceedingly fertile that three days' work is sufficient to provide sustenance for a native for a whole year. No wonder that the inhabitants of these regions are inclined to be idle, and take things as easily as possible.

The early missionaries and settlers tell us that often when they tried to get the natives to build more comfortable houses and adopt different modes of civilized life, they would answer: We should like some of these things very well, but we cannot have them without working; that we do not like, and therefore would rather do without them. The bananas and the plantains ripen on the trees, and the pigs fatten on the fruits that are strewed beneath them, even while we sleep; these are all we want, why therefore should we work?

STRANGE SIGHTS ON EASTER ISLAND.

The natives of Easter Island are fair Polynesians, resembling those of Tahiti and the Marquesas, but they are said to be occasionally cannibals. They make long low houses, something like a canoe turned upside down, with a small opening at the side which serves for door and window; but there are much better and more interesting houses than these in the island built of stone, about which the present inhabitants know nothing. Easter Island is celebrated for the wonderful remains of some prehistoric people, who must have lived there ages before the race who now inhabit it, and about whom the people there now cannot tell us anything at all. The remains consist of these stone houses, sculptured stones, and gigantic stone images. The houses are built in regular lines, with doors facing the sea, the walls are five feet thick and nearly six feet high, they are built of layers of irregularly-shaped flat stone, and lined inside with upright flat slabs. These are painted with figures of birds and animals, chiefly fabulous creatures (for quadrupeds are little known in Easter Island), and geometrical figures. Quantities of a particular kind of shell were found inside the houses, and in one of them a statue eight feet high was discovered, which is now in the British Museum; it weighs four tons. Near these houses the rocks on the brink of the sea cliffs are carved into all sorts of strange shapes, sometimes like odd human faces, and sometimes like turtles. There are hundreds of these carvings, often overgrown with bushes and grass of a very course rank kind which grows over the island. But the most extraordinary of these ancient remains are found on nearly every headland round the coast, where there is almost always an enormous platform of stone, more or less in ruins. Towards the sea there are high walls built of immense stones most ingeniously fitting into one another without cement, and within stone platforms and terraces have been leveled with large slabs which have been pedestals for the images, now thrown down in all directions and



WONDERFUL MONUMENTS ON EASTER ISLAND.

more or less broken to pieces. One of the most perfect of these platforms had fifteen images on it. Most of these statues were fifteen or eighteen feet high, and some thirty-seven feet. The figures are human bodies without legs, the heads being flat to allow of crowns being put on: these crowns were made of a red material found only at a crater about three miles from the stone houses. At this place there still remain numbers of these crowns, some of them ten feet round, waiting to be removed to the heads for which they were intended. How it was that they were never placed on these heads, what brought this strange work suddenly to an end, or who were the people engaged in it, we do not know, and shall probably never find out. A certain stone implement, a long pebble with a chisel edge, is believed to have been the chief tool used in making these wonderful statues, but it is almost impossible to believe that with this alone such gigantic works could have been executed in such numbers and in such a small island, isolated from the rest of the world.

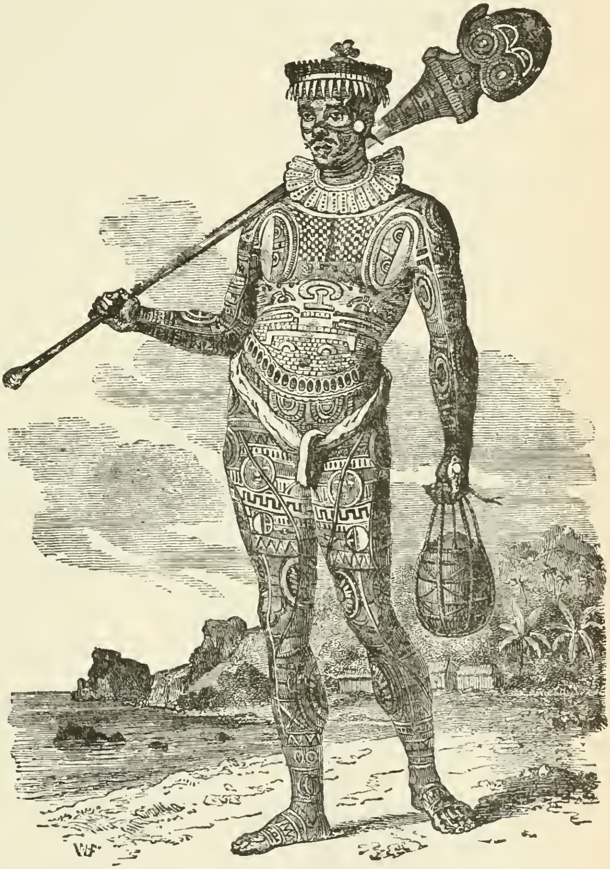
The difficulty is so great that some writers believe that there may have been once a civilization over the Pacific Ocean of which neither we nor the inhabitants we found there have ever heard or know anything. Possibly Easter Island may have been a sacred spot to all the islands round, and different tribes may have combined together to erect these wonderful images there, and may have worshiped them as their gods. But nothing is known for certain, and Easter Island remains the greatest mystery of the Pacific Ocean, a wonder unexplained.

MARVELS OF COPPER-COLORED BEAUTY.

The group of islands called the "Marquesas" was named in honor of a Spanish marquis, who discovered them in 1595. The islands are very numerous, and vary in size from ten to twenty miles. They are not encircled or protected by coral reefs, though there is plenty of coral to be seen on the beach; the coast is very rocky and abrupt, but there are many good harbors, such as Resolution Bay in Tahuata, which is a particularly fine and safe one. All the usual fruits and plants of the South Seas grow there, and the climate is warm, but very healthy. The inhabitants belong to the same race as those of the Society and Sandwich Islands. They have dark copper-colored skins; but that of the women is much paler than of the men. They are said to have wonderfully beautiful figures; and one navigator describes a chief the measurements of whose body agreed exactly with those of the Apollo Belvedere. The tattooing with which he was adorned must have entirely destroyed the resemblance to the Apollo. This art is carried to a greater degree of perfection in the Marquesas Islands than in any other nation. The bodies of distinguished persons are completely covered with regular figures in most tasteful and elaborate patterns; and this process makes their skin darker than it would be otherwise. The women, who are nearly as fair as Caucasians, and very beautiful, do not often disfigure themselves in this way, being content with their natural adornment.

The island of Java has been styled, on account of its natural beauty and fertility, "the Queen of the Eastern Archipelago." It forms a leading link in the great chain of islands extending from the Bay of Bengal to the shores of New Guinea. In this crescent Java occupies the middle place. It is bounded north by the Java Sea, and south by the Indian Ocean. It measures six hundred and thirty miles in length, and varies from thirty-five to one hundred and twenty-six miles in breadth. Its total area is nearly two-thirds of the area of the New England States.

On the south by the Indian Ocean, the coast is steep and rocky, and forms a sufficient rampart against the incessant roll of the billows; but on the opposite side, where only a shallow channel separates it from Borneo, the land terminates in a low, flat, alluvial plain, bordered by extensive mangrove swamps. The coast-line is irregular and broken, especially on the north.

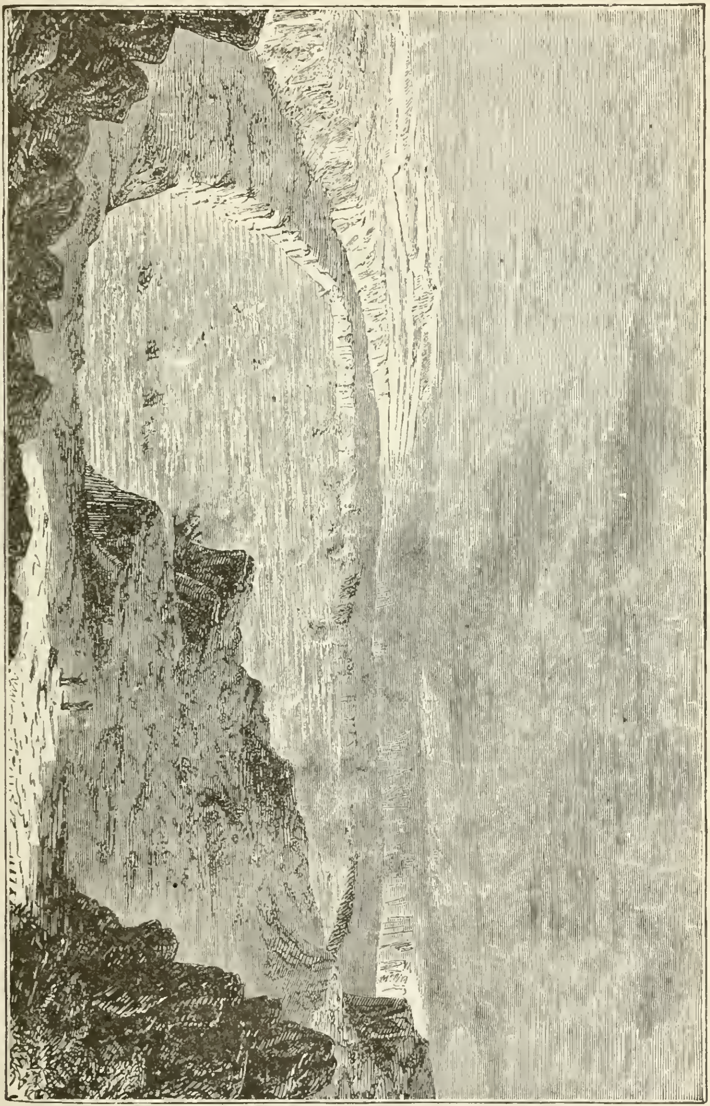

A TATTOOED CHIEF OF THE MARQUESAS ISLANDS.

Throughout its entire length Java is traversed by two chains of mountains, which occasionally unite, but more frequently run at some distance from one another, and send spurs and branches of the most various outline down to the shore. These chains are lofty and imposing; grand in outline, and surrounded by mighty forests. Occasionally their towering peaks soar to an elevation of twelve thousand feet; they seldom descend below seven thousand; and the average height of the volcanoes with which each chain is thickly studded, may be taken at nine thousand feet. Many of the volcanoes are still active; so that along the axis of the island a series of fire-towers seem to be planted, like burning beacons, to throw their warning light far over the Indian seas. This volcanic character of the mountains, while accounting for the fertility of the island, also explains the peculiar aspect of its scenery. They have nothing of that austere, that almost terrible grandeur which distinguishes the heights of the Alps and Rocky Mountains. They are remarkable for beauty rather than sublimity. Volcanic cones are so regular in their shapes, and stand out so definitely as objects of perfect form and symmetrical outline, that they give an almost architectural tone to the scenery. One traveler compares them to noble columns or pyramids which are perfectly beautiful, in the recesses of which the imagination loves to wander, and at times to lose itself. The volcanic peaks of Java, moreover, are clothed even to their topmost ridges with wood and green waving grass, except one or two summit cones of cinders and ashes fresh from the crater; but these, too, from the effect of distance, look as smooth as if built up of sand, and are regular in shape.

A MAGNIFICENT LANDSCAPE.

Mr. Jukes enables us to realize the general features of a Javanese landscape from one of his descriptions. He sketches the picture which unfolds before the spectator from the north-west corner of the broad green, undulating valley-plain of Malang. On the right hand, towards the west, rises the picturesque group of the Kawi, from which a verdurous but broken and serrated ridge strikes northward to the grand mountain-mass of the Ardjoonoo, immediately in our rear, with its peaked summit and shaggy sides, occupying all the north-western quarter of the horizon. A low gap in the north has been seized upon by man, and cultivated, while a road running through it opens up access to the northern coast and its towns and harbors. Towards the east, with many a bristling peak and ridge, towers the massive Tengger range, reaching its greatest elevation in the large crags and buttresses of the Bromo and the Ider-Ider. Thence it curves towards the south-east, to crown itself with the shapely and symmetrical cone of the Semiru, and present a scene of great natural sublimity.

The chord of this magnificent amphitheatre, or the distance between Semiru and the Kawki, is nearly forty miles, and is formed by low undulating ridges which close the prospect on the south. The aspect of this great valley is joyous and exultant with luxuriant beauty; everywhere it is fresh, and fertile, and radiant; bright in tint and varied in outline; while even the wildest and ruggedest of the mountains are profusely clothed with virgin forests, except the two cones of the Semiru and Ardjoonoo, where still reigns the demon of the volcanic fires.



A REMARKABLE VOLCANIC CRATER, ISLAND OF JAVA.

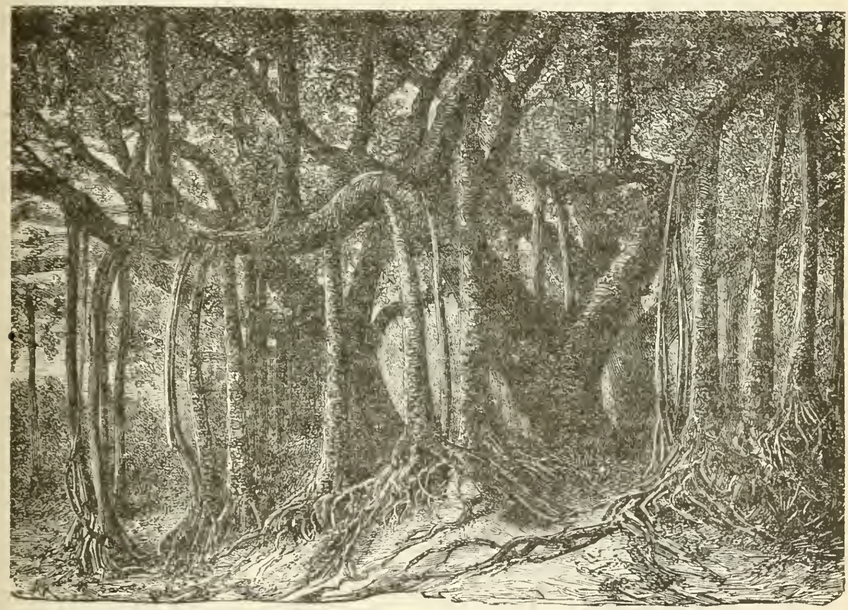
Java has been appropriately called the Land of Fire. It possesses upwards of forty volcanic mountains, which, taken together, display all the phenomena of igneous action, except lava-streams, which never occur in Java. The active craters are remarkable for the quantity of sulphur and sulphurous vapors which they discharge. The crater of Taschem contains a lake, about a quarter of a mile in length, from which issues a stream so strongly impregnated with sulphuric acid, that no forms of life can exist in it, and even fish cannot live in the sea near its mouth. Near Butar, an extinct volcano, about half a mile in circuit, is known as the "Vale of Poison." No living creature can enter it with safety; and it is said that the soil is strewn with the carcasses of birds, deer, and other animals, killed by the fatal carbonic acid gas which accumulates in the hollow of the deadly valley.

Owing to its mountainous character, Java has no great navigable rivers; but it is watered by many shallow streams, which carry brightness and fertility along with them in their rapid course. These may be ascended to some distance in the light proas and canoes of the natives; but only a few are open to vessels of any considerable burden.

Much of the charm of the Javanese landscape lies in the extraordinary richness of its vegetation, which clothes every valley-side and every mountain-height with masses of diversified foliage. This richness is not to be wondered at, when we remember that the soil consists of decomposed volcanic rock, limestone and sandstone; that it is abundantly watered, either by nature or by art; and that the climate exhibits a remarkable range of temperature. At an elevation of six thousand feet the thermometer does not rise above sixty degrees; in the plains, during the day, it ascends from eighty-five degrees to ninety-four degrees, and during the night from seventy-three degrees to eighty degrees. The character of the natural products of the island is necessarily affected by this variation of temperature; and the traveler, beginning with the flora of the Tropics in the plains and warm moist valleys, ends with that of the Temperate Zone on the breezy mountain-heights. The coast, which in some places is fringed with coral reefs, is generally lined with feathery groves of cocoa-nut trees. Inland spread vast fields of rice, extending up the sides of the hills, and irrigated by a multitude of artificial water-courses. They yield two and three crops a year. Hedges and terraces rise to a considerable height, which, as they wind round the flanks of the hills, produce all the effect of stately amphitheatres. Hundreds of square miles of country are thus terraced, and convey a striking idea of the industry of the people and the antiquity of their civilization. These platforms are annually extended as the population increases, the inhabitants of each village working in concert under the direction of their chiefs; and it is by this system of village culture alone that such immense areas of terraces and irrigating canals have been rendered possible.

The wonderful mountain vegetation almost surpasses any adequate description. The colossal wild fig-trees are among the most grateful presents of Nature to hot countries; the shade of their magnificent head refreshing the traveler when he reposes under their wonderfully wide-spreading branches and dark, green, shining foliage.

The most remarkable species is the banyan. In its early state the banyan resembles other trees in having a single trunk of variable size, and a dense head of foliage. The branches spread out horizontally to so great an extent that they would be unable to support themselves simply by their attachment to the parent stem. To supply the necessary support the branches throw out here and there small fibrous shoots towards the ground. On reaching the ground they take root, gradually increase in size, and become stable supports for the parent bough, and even rival the original trunk itself. A fresh start is taken from these secondary stems, and the lateral branches continue to throw out new shoots until the plant attains an extent which is almost incredible, and alone forms in time a considerable forest. The height of the tree is at the same time slowly increasing. Single trees have been seen which



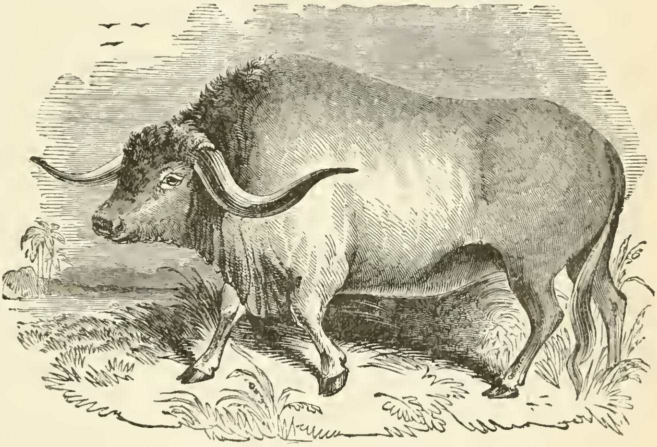
A TREE WHOSE BRANCHES TURN TO ROOTS.

were fully five hundred yards in circumference round the extremities of the branches, and about one hundred feet high. The principal trunks were twenty-five feet to the first branches, and had a diameter of eight or nine feet. They are largest about the villages which are situated in fertile valleys among the mountains. They daily afford shelter to man and cattle, to pilgrims and travelers, who at times congregate in great numbers beneath their branches. The public meetings and merry-makings of the villagers are held under their grateful shade.

The leaves of the banyan are of an elliptical cordate shape, about six inches long. They are used by the natives as plates for their meat. The wood is light, white and porous. The fruit, which grows on the smaller twigs, has no stem; when ripe it has the size and color of a middle-sized red cherry. It is eaten by monkeys, paroquets and other birds, but is insipid, and therefore seldom made use of by natives, and never by white men, as an article of food. The seeds are said to grow the better after having been picked by birds. Birds scatter them in the most curious places, sometimes in the angles between the leaves and stem of the Palmyra palm, where they grow, sending down their stem, so as to embrace entirely the palm, except its crown of feathery leaves, and giving the palm the appearance of growing out of the trunk of the banyan. Such a combination forms an object of religious veneration to the Hindoos, who call it a holy marriage instituted by Providence.

The banyan is generally supposed to be the only fig whose branches send down supporting stems into the earth. Recently another species has been found in one of the islands of the New Hebrides Group which has the same habit. Its leaves are very small, scarcely an inch long. One tree, described by its discoverer, was one hundred feet high, forty-five feet around the trunk, and its branches covered a space two hundred and sixty feet in diameter. The natives had built their houses under its shade.

The bases of the mountains, whither we must now carry our survey, are clothed with vast forests of different species of the fig-tree tribe; some of which seem allied to the Indian banyan; all are interlaced and bound together by creepers and trailing parasites, and are remarkable for their immense height, so that their overarching foliage glimmers like a green mist, their milky sap, their fruit, and their far-spreading branches. At about the same height above the sea grow noble trees of different families, their boughs embellished with fantastic orchids, and their trunks covered with parasites, while among the low undergrowth rise grand arborescent ferns of surpassing beauty. Here we meet with the screw-pine, in stature and character resembling the palms. Higher up we come to the plane-like liquid-ambars, their tall and shapely stems clasped round by fences of fruit-trees here and there, inclosing the Javanese villages, in which the huts are built of bamboo, and with their high-pitched roofs and quaint construction seem to have been modeled after the well-known architectural designs of the willow-plate. The white buildings and tall chimney of a sugar-mill occasionally diversify the prospect; the open fields are skirted by rows of bamboos; and the straight and well-kept roads run through monotonous avenues of dusty tamarind-trees. At each mile, in a queer little wooden guard-house, a policeman is stationed, who communicates with his comrades by means of a gong; and the din of that discordant instrument frequently alarms the echoes of the quiet country. If we penetrate further inland, we come upon the remains of deserted cities, now given over to the wild bull and the tiger; or in the recesses of the forest we pause before some colossal statue of a god, or one of the ancient temples, such as that of Borobodo. Here a central dome, fifty feet in diameter, and surrounded by a triple circle of seventy-two towers, covers, with its terraced walls, the entire slope of the hill. Such magnificent specimens of human industry and science are seldom found in so small a compass!


THE WILD OX OF JAVA.

We may now take a rapid glance at the animal life of Java. If domestic and marine animals be included, it boasts of no fewer than one hundred species of mammals. In the west of the island the one-horned rhinoceros stalks among the ruined temples; and in the high wooded districts and dense jungles of the upper valleys may be found the tiger-cat, the panther, and, more formidable than either, the royal tiger, annually demanding its human victims. Neither the tapir nor the elephant is an inhabitant of Java. Among the Suidæ may be named the wild hog and the babyroussa; the latter a fierce and dangerous animal, with four strong tusks projecting above the snout. The napu, or Java musk, is one of the most graceful of the moschine deer. The wild ox is numerous in the woods, and remarkable not less for the beauty of his shape than the untamableness of his disposition. Of the Ape family the only representatives are the silvery gibbon, and the ubiquitous "tailed ape;" these are found in almost innumerable hosts, and the forests resound with their noisy chatterings.

Two kinds of lemurs belong to Java, and are regarded by the natives with all the dread that arises from superstitious ignorance. Probably their alarm is increased by the animal's nocturnal habits. For it is at night that the loris awakes from its slumbers: night, when the birds on which it preys are resting in unsuspicious tranquility, with their heads screened by their soft plumage. Then through the forest-gloom its large round eyes burn like two balls of red-hot iron; and by these eyes alone can its presence be detected, for, owing to the color of its fur, its outline is invisible, and its white breast may be mistaken for a slanting moonbeam falling athwart a branch. With slow and stealthy movements it glides along the trees—lifting paw after paw, and advancing step by step, until it has gained its victim's resting-place. The destroyer raises its hand, until the long, curved fingers overhang and nearly touch the sleeping bird, which in a moment is torn from its perch and slain, almost before it has opened its startled eyes.

To Java also belongs the largest member of the Bat tribe, measuring five feet across its membranous wings. It abounds in the neighborhood of the orchards and gardens; hanging suspended from the branches during the day, and then at night banqueting freely upon stolen fruit. Java is dowered with volcanic fires. Notwithstanding its limited area, it possesses as many as the entire American continent, and all of them more terrible than burning Etna. And to these we must add its liquid volcano, its vein of sombre azure, which the Javanese call the "Black River." This is the great Equatorial Current, which, in its northerly course, warms the Asiatic seas; is remarkable for its muddiness; and tastes salter than human blood.

A hot sea—a torrid sun—volcanic fire—volcanic life! Not a day passes but a tempest breaks out among the Blue Mountains, with lightning so vivid that the eyes cannot endure to gaze at it. Torrents of electric rain intoxicate earth and madden vegetation. The very forests, smoking with wreathed vapors in the burning sun, seem so many additional volcanoes situated midway on the mountain slopes. In the loftier regions they are frequently inaccessible, and sometimes so thickly intertangled, so dense, so gloomy, that the traveler who penetrates them must carry torches even at noonday. Nature, without an eye to watch her, celebrates there her "orgies of vegetation," and creates her river-monsters and colossi.

CHAPTER X.

WONDERS OF SOUTH AMERICA.

History in Stone—Peru and its Marvels—Dangers of Exploration—Grandeur of Mountain Scenery—Ancient Temples—Dress of the Natives—A City of Wealth—Warriors—Brazil and its Palace—Negro Women—Medical Jugglers—Cotton—Sugar-Cane—Magnificent Forests—Products of the Country—Volcanic Flames—Wild Horses—Birds and Animals—The Matamata—The Spider Crab—The Wasp—Wonderful Lilies—The Patagonians—Strange Customs and Manners.

WHY America should have been called the New World is rather strange. It must be really a very old world; for this reason, that a great many old temples and figures, and buildings of all kinds, have been dug up from beneath the earth's surface. As it is utterly impossible that such things should have come by chance, they prove to us that people must have existed hundreds—and perhaps thousands—of years ago, who were clever enough to make them. It is not likely we shall ever know who these people were, for they have left no written record of themselves, excepting the characters or hieroglyphics, as they are called, which are cut out on some of the huge stone blocks that have been dug up; and these characters, which no doubt mean a very great deal, are not intelligible to us.

One division in South America of surpassing interest is Peru. Unfortunately, however, the more we learn about it the more we are convinced that a great deal of its history we can never know, because the first inhabitants have been dead for many ages, and have not written any books or left any definite record to tell us who they were, where they came from, and many other particulars, respecting which we should like to be enlightened, but we know enough about far-famed Peru to convince us that it is a land of wonders.

Down the west coast of it are the lofty Andes, which are capped with snow at the summit, while below in some parts are lovely shrubs and flowers, and birds warbling their sweet notes among the thick waving branches. Grand as these mountains are, travelers who venture to ascend their steep and rocky sides, run great risk of being thrown down a deep precipice, or dashed into some deep, dark chasm. The Indian natives get accustomed to the narrow winding zigzag paths, and are almost as surefooted as the mules under their charge; but to every one else the task is much more difficult, especially if, in the midst of the ascent, a hailstorm should overtake the traveler. One who has never crossed the Andes can form no idea of the violence of one of these storms. The hailstones are something tremendous, coming down with such force as to stun not only the riders but also the patient mules; all that the poor traveler can do is to turn his back to the wind, and shield himself from danger by hiding his neck and ears in the folds of his cloak, and suffering the fierce storm to spend its fury.

An intelligent native of Peru, describing its marvelous scenes, says. The first objects I ever remember beyond the courtyard of our house in which I used to play, with its fountain and flower-bed in the centre, and surrounding arches of sun-burned bricks, were lofty mountains towering up into the sky. From one of them, called Pichincha, which looked quite close through the clear atmosphere of that region, I remember seeing flames of fire and dark masses of smoke, intermingled with dust and ashes, spouting forth. Now and then, when the wind blew from it, thick showers of dust fell down over us, causing great consternation; for many thought that stones and rocks might follow and overwhelm the city. All day long a lofty column of smoke rose up towards the sky, and at night a vast mass of fire was seen ascending

THE DISCOVERY OF AMERICA—LANDING OF COLUMBUS.

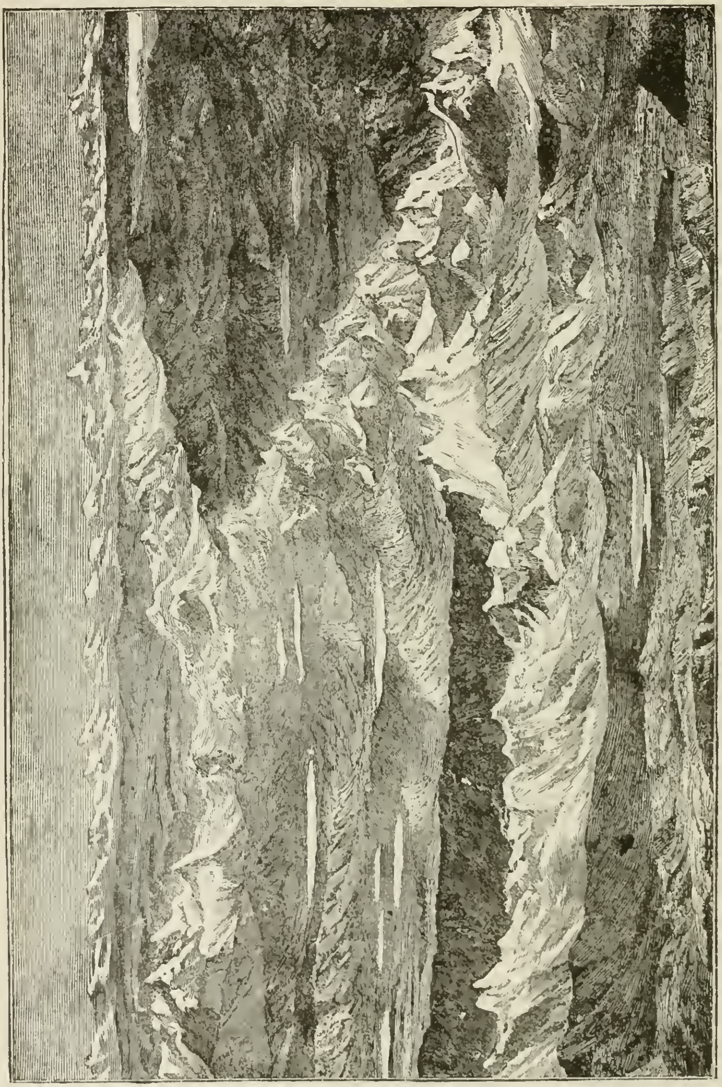
from the summit; but no harm was done to the city, so that we could gaze calmly at the spectacle without apprehension. Pichincha is, indeed, only one of several mountains in the neighborhood from the tops of which bonfires occasionally blaze forth. Further off, but rising still higher, is the glittering cone of Cotopaxi, which, like a tyrant, has made its power felt by the devastation it has often caused in the plains which surround its base; while near it rise the peaks of Corazon and Rumiñagui. Far more dreaded than their fires is the quaking and heaving and tumbling about of the earth, shaking down as it does human habitations and mountain-tops, towers and steeples, and uprooting trees, and opening wide chasms, turning streams from their courses, and overwhelming towns and villages, and destroying in other ways the works of men's hands, and human beings also, in its wild commotion.

MAGNIFICENT MOUNTAIN PEAKS.

These burning mountains, in spite of their fire and smoke, appear but insignificant pigmies compared to that mighty mountain which rises in their neighborhood—the majestic Chimborazo. We could see far off its snow-white dome, free of clouds, towering into the deep blue sky, many thousand feet above the ocean; while on the other side its brother, Tunguragua, shoots up above the surrounding heights, but, in spite of its ambitious efforts, has failed to reach the same altitude. I might speak of Antisana, and many other lofty heights with hard names; but I fancy that a fair idea may be formed of that wonderful region of giant mountains from the description I have already given.

I used often to think that I should like to get to the top of Chimborazo, the way up looked so easy at a distance; but no one has ever reached its summit, though several valiant philosophers and others have made the attempt. The mountain range I have described, of which Chimborazo was long considered the highest point, till Aconcagua in Chili was found to be higher, rises from the ocean in the far-off southern end of America, and runs up along its western shore, ever proud and grand, with snow-topped heights rising tens of thousands of feet above the ocean, till it sinks once more towards the northern extremity of the southern half of the continent, running along the Isthmus of Panama, through Mexico at a less elevation, again to rise in the almost unbroken range of the Rocky Mountains, not to sink till it reaches the snow-covered plains of the Arctic region.

The Cordilleras are the high mountains that divide Peru and Chili from the rest of South America, and very dangerous it is for travelers to attempt to cross them, on account of the tremendous snowstorms, which come on quite suddenly. By reason of these snowstorms, houses of refuge are built among the mountains, with thick brick walls, and with nothing but loopholes for the windows; and even then, within these snug houses, travelers have frequently been frozen to death, and have left their bones in the desolate solitude.



GRAND PANORAMA OF THE ANDES.

Once ten poor travelers were overtaken in one of these dreadful storms, and finding it useless to attempt proceeding further on their journey, they managed to squeeze themselves into one of the houses of refuge, which they saw standing empty. How long they had been obliged to remain there no one ever knew, for when they were found, six of them were quite dead, and the other four were nearly so; they could not speak. Having no food, they had killed their mules and eaten them, and also their one faithful dog; the door they had pulled from its hinges, and broken into pieces to burn for firewood. All this told a sad, silent tale of what the poor creatures had had to endure.

The names of Peru and Pizarro are linked together because it was a young Spaniard of the name of Pizarro who, soon after the death of Columbus, conquered the country and took possession of it. Different adventurers kept returning from the newly discovered world, with wonderful tales of the quantities of gold and silver that were to be found. So Pizarro, who, as a little boy, had spent a great deal of his time doing nothing better than minding pigs, determined to change his occupation, and see for himself this fairy land, which was being so much talked about. On landing on the foreign shore, he managed to gain favor with the natives, who gave him presents of gold and silver ornaments, and silk and woollen cloths of their own manufacture, and some animals called alpacas. These he took back to the Spanish king, as proof of what he had seen; and as a reward the king made him governor of Peru, and secured to him the right of the discovery of the place.

STRANGE RELICS OF ANCIENT TIMES.

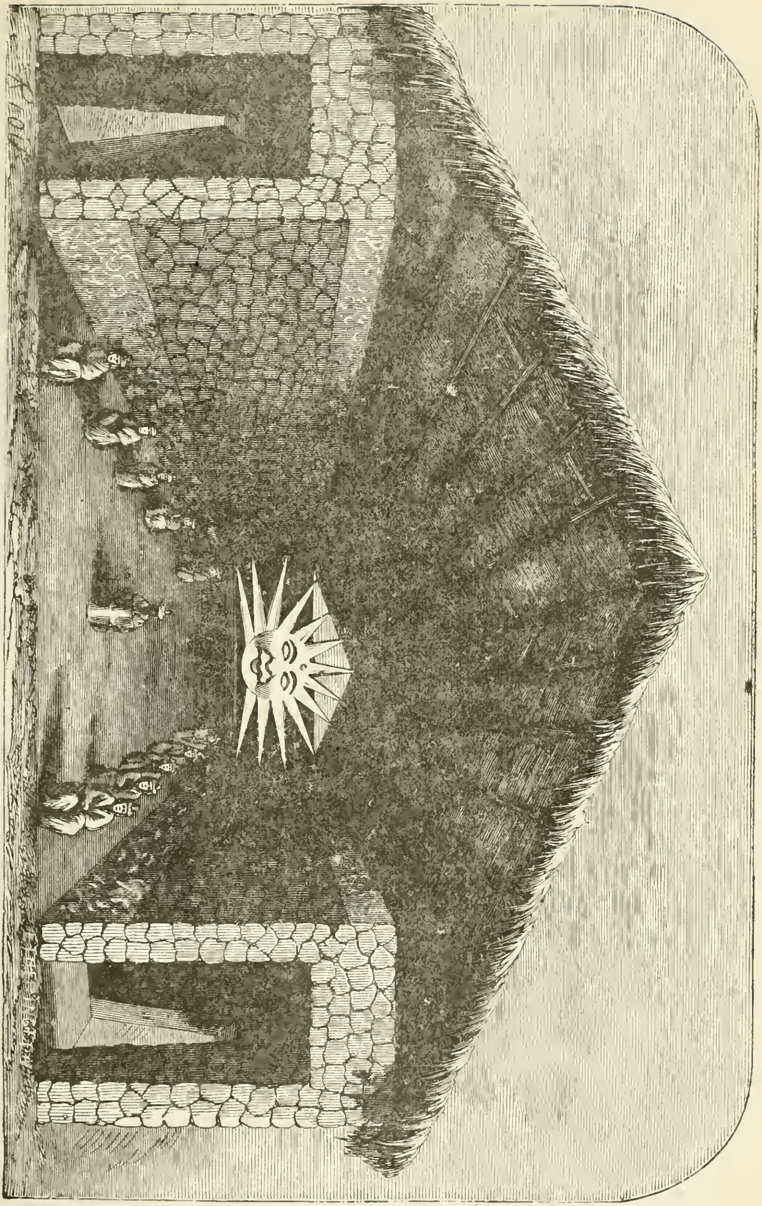
Pizarro joyfully returned to the land of gold. The people he found living there were called Incas, who were very clever, and, as Pizarro soon found out, were much wiser in many ways than he was himself; but how long they had been there they could not tell him. This much he ascertained, however—that they were by no means the first inhabitants of the place; long before their time a race of people had dwelt on the ground where they then stood, who must have been quite as advanced in civilization, or even more so, than they were themselves. This fact has been confirmed in later years by other visitors to Peru, who have dug out ruins of buildings and idols, that had no doubt been swallowed up at some time by earthquakes. Not very long ago, a number of idols were dug up, some of which were thirty feet long. What they proved, of course, as they were taken out of the darkness, was, that at some period in that region, idolatry had prevailed. Besides which, they are specimens of what the people could do in the way of architecture. Indeed, all the old remains that were found told some tale or other. Buried prisons, for instance, told that crimes had been punished by confinement, and cooking utensils explained how the food of the people used to be prepared.

According to tradition, we are told that Manco, the first Inca, and his wife Mama Oello, first made their appearance on the borders of the lake Titicaca. They said the sun was their father, and that he had sent them down to their fellow creatures to be their teachers. Manco had in his hand a golden wand, which he said would at some particular spot disappear, when he struck the ground with it. One day, as he and his wife were traveling, they came to the plain of Cuzco, when all at once Manco struck his golden wand. It immediately disappeared, so at Cuzco he built his capital, and afterwards was built there the magnificent Temple of the Sun, called Coricancha, or Place of Gold. From all we have heard, this temple must have been most gorgeous; almost as splendid as the sun himself, of which it was the representation. On the western wall was fixed an immense human face, made of gold, from which golden rays darted in every direction. In other parts of the building were golden images, plates, and figures of all descriptions. So that when the real sun himself shed his glorious beams into the edifice, the place was one mass of light and splendor. Underneath the great face of gold were a number of golden chairs in which were seated the embalmed bodies of the old Inca rulers. In the court outside, smaller temples were built, one to the Moon, one to Venus, one to Pleiades, one to the Thunder and Lightning, and one to the Rainbow, all of which were richly decorated with gold and silver. At the present time a church and a convent stand on the place once occupied by the Temple of the Sun. According to the legend, Manco, after losing his golden wand, became ruler and priest in the land; he made laws, taught the men how to dig, sow, and build, while at the same time Mama his wife taught the women to weave and spin. After thus spending their lives for forty years, they returned to the Sun their father.

GORGEOUS WEALTH OF PERUVIAN TEMPLES.

We can imagine how much wealth those old Peruvian Indians gave to their temple when we are told that after the country was invaded, one of Pizarro's pilots asked if for his share of the prize he might have the nails and tacks which bore the sacred name on the walls of the temple, and on the request being granted to him he gathered together and took away thirty-two thousand ounces of treasure. It is very little we should know about this strange place, if it were not for all the graves it contains; and though dead men cannot speak, these graves tell us in silent language a great deal about the past. The old inhabitants, it seems, never attained to a written language, but fortunately they were accustomed to bury with their dead the things they most cared for when living, and from these we find out some of their habits, and what their religious notions and beliefs were.

One grave, for instance, was found of a man, his wife, and three children. The man had evidently been a fisherman, for round his neck



THE WONDERFUL PERUVIAN TEMPLE OF THE SUN.

was hung a net made of the twisted fibre of a plant, and, wrapped in a cloth between his feet, were some fishing lines of different sizes, and some copper hooks. Under each arm was a roll of white alpaca wool, and in his mouth a small thin copper coin, meant, very likely to pay his way across the river of death. It was the custom of the ancient Greeks to adopt the same plan of putting a coin into the mouths of their dead friends. The body of the wife was wrapped in a sheet of fine cotton cloth, on which were woven figures of the sacred monkey. In one hand she held a comb made of fishes' fins stuck into a slip of hard palm-tree wood. In her other hand was part of a fan with a cane handle, and to which were still attached the faded feathers of parrots and humming-birds. Around her neck was a necklace of shells that almost fell to pieces when exposed to the air and light.

A LITTLE GIRL'S GRAVE AND WHAT IT CONTAINED.

Resting between the body and bent-up knees (for in that position most of the dead people were buried) were several domestic articles, among them an ancient spindle for spinning cotton, half covered with spun thread. The Indian women of the present time use the same kind of spindle. By her side was a prettily made bag, of colored cotton cloth, containing first of all some Lima beans; a few pods of cotton; some fragments of a silver ornament; two little silver rings that most likely had been coins; and a number of small valuable beads. In the box containing the body of the little girl were some pieces of knitting that the child had done; in some places the stitches were dropped, just as though the little learner had been taking her first lessons.

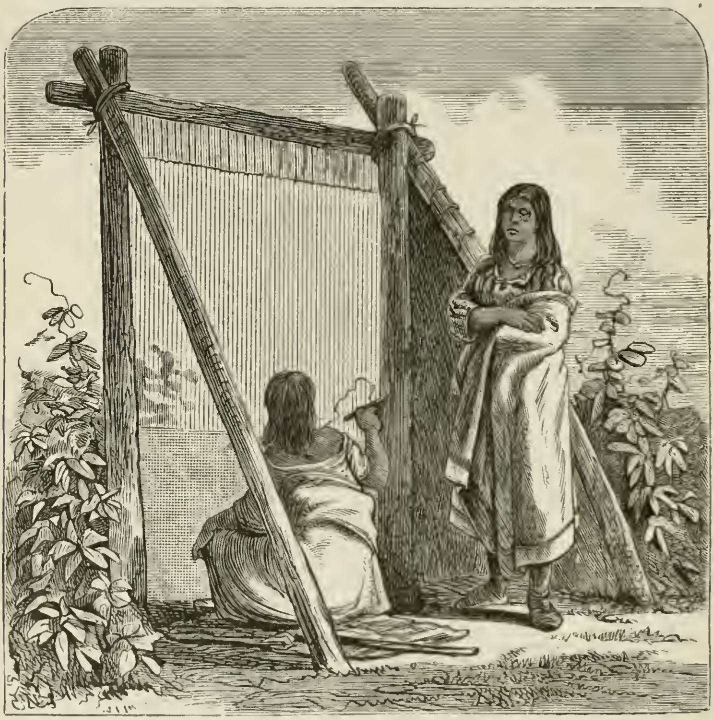
Then there were braids of thread of various thickness, that had evidently been kept to show how the little girl had improved in her weaving and winding as she grew older. There were also skeins of thread, strips of colored cloth, knitted and woven pouches of all sizes, needles of bone and of bronze, a comb, a bronze knife, and a little fan. In addition to all these things, there was a little piece of polished iron that had no doubt served as a looking-glass, a netting needle of very hard wood, and a crushed gold butterfly that the little girl had most likely treasured very much. On her arm hung a thin silver bracelet, and at her feet laid the dried body of a parrot, that had once been the child's pet, no doubt. The burial of all these articles with the dead bodies proved that the inhabitants of Pachacamac believed in a future state, and thought that the buried things would be useful to the possessors of of them in another world. The little boy had a sling tied tightly round his forehead, and then, what seems still more strange, a quantity of pans and pots were lying in the vault, the people who put them there evidently thinking that after death their friends would require food.

After all the changes it has undergone, Lima, the capital of Peru, still is a rich, gay city, containing within its walls the bones of its great founder Pizarro. As a proof of its wealth, one of its viceroys once rode through its streets, over a pavement of solid ingots of silver, on a horse whose mane was strung with pearls, and whose shoes were of gold—so much do the inabitants think of wealth and show. Owing to the absence of rain in the region where Lima stands, and to the fact that an earthquake may be expected at any time, most of the houses are built of very light materials, because a strong building of brick or stone would be no protection during an earthquake. Many of them are little more than large cages of canes plastered over with mud, and then made to imitate stone. The roofs are flat, because the absence of rain renders a sloping roof unnecessary; and even churches and large buildings that look strong and massive have really no foundation stronger than a number of poles and canes tied together. Under a brisk shower, such as we often experience of a summer afternoon, the whole city would melt away, leaving only a mass of broken canes in a great mud puddle, and the inhabitants would be houseless.

A TERRIBLE CALAMITY.

Both in Chili and in Peru the people have many times been visited by earthquakes that have swallowed up a number of them alive, with their houses and cattle, but not very long ago, in the year 1863, a misfortune quite as sad as an earthquake came upon the inhabitants of Santiago. A very important festival was being held at the cathedral, which was decorated magnificently for the occasion, and was filled with people who had assembled within the walls to worship. By some means or other, part of the gay ornaments took fire, when, at the sight of the flames, the frightened people rushed to the different entrances, crushing and mangling each other by trying to make their exit. The number who perished at the time is said to have been between two and three thousand, chiefly women. The poor creatures were either burnt to death, suffocated by smoke, or killed by the falling stones and rafters. On the spot, in place of the cathedral, now stands a monument in memory of the awful event.

Before the Spaniards made their appearance at all in the country, the old Incas or rulers from Peru had crossed that great desert of Atacama, which, though so rich in silver mines, is a terribly dreary place, and had taken possession of as much territory as they could seize. Owing to the absence of rain, the soil of this desert is so dry and arid that no plants or vegetables will grow in it. Fortunately a railway runs across its dreary waste now; consequently, travelers who wish to cross it, need not long be exposed to the misery that a long sojourn would necessitate. When Almagro arrived in Chili, he found a large portion of it peopled by a tribe of Indians called Araucanians; and of all the red men in South America, these Araucanians seem to have been most determined not to let the Spaniards conquer them. They were a wild, warlike people, who loved horse-riding; and very clever riders they all were, both men and women. Their houses were merely wicker-work frames plastered with clay, and although they seemed happy enough—men, women, children, dogs, and horses, all huddled up together at night—Almagro and his friends no doubt thought it a miserable state of things. It was lawful amongst them for a man to have as many wives as he liked, but as the rule also was that every day each wife should give to her husband a dish of food prepared at her own fire, the number of fires in each habitation was not unfrequently considerable. A polite way of asking a man what number of wives he was blessed with was to say, "How many fires have you?"



INDIAN WOMEN OF CHILI.

The women are not without some degree of taste, and often may be seen embroidering and decorating screens. Their hair is usually worn long and loose, and their dress is of a light order, suited to a tropical climate. Their complexion is dark, and their general appearance not very inviting.

For their religious observances the natives required neither temple nor priest ; all they did by way of worship was to sacrifice some animal under a particular tree in the forest which they considered sacred. Like most ignorant people, they were highly superstitious. They thought, for instance, that when one of their tribe died from any other cause than old age, some evil spirit had been at work ; and before partaking of food they always sprinkle on the ground a small quantity of whatever they had spread before them by way of gaining favor with the evil spirits, which seems to be a shrewd way of buying him up.

A STRANGE METHOD FOR OBTAINING GUNPOWDER.

A few of these bold, wild men are still left in Chili, and may be seen roaming happily about on the banks of rivers or in deserted villages. Their idea of freedom is to be allowed to wander at will in any direction they like, and they have the notion that people who dwell in walled cities are slaves. When they fought with the Spaniards they were sadly puzzled to find out how gunpowder was made, for they saw, of course, how useful it was to their enemies in battle ; but what they actually did to discover the secret you could never imagine. They noticed that among the Spaniards were some negro soldiers, whose color, they thought, resembled gunpowder. Consequently the first negro that was taken prisoner by them they burnt alive, hoping that they would obtain the precious gunpowder from his ashes.

Most of the silver mines in South America are found at an immense height up the mountains, very near the limit of perpetual snow. Therefore, in order to explore them, men and provisions have to be brought from a great distance. Those mines which are lower down on a level with towns or villages are, of course, more easily worked. The richest silver mine in Peru is at Potosi, but many of the South American Indians are made to work so hard, digging out these precious metals, that they have no doubt often wished the foreigners had never discovered them. Indeed, some of the Indians are sly enough to keep the knowledge to themselves as to where certain mines are to be found, so that when they want any for their own use they can go alone secretly and take as much as they require.

SINGULAR STORY OF A MONK.

There was once an old monk in Peru who lost a large sum of money, and so troubled was he in consequence that a great friend of his, an Indian, by way of consoling him, went and obtained for him a bag full of silver. The monk, instead of being satisfied, asked for more, then another bag, then another, and actually at last said he should like to see the mine where all the silver came from. He was so eager in his request that his friend consented to gratify his curiosity; so one night the Indian, with two companions, went to the monk's house. First of all they blindfolded him; then, instead of letting him walk, they carried him in turns on their shoulders—how far the monk did not know—until at last he was put down on the ground and the bandage taken from his eyes. To his great delight he then found himself in a real mine, surrounded by large pieces of solid silver, of which he was told he might take as much as he liked.

The old monk filled his pockets to the utmost, and took in his arms and hands as much as they would hold, but, to his sorrow, instead of being allowed to walk home alone, he was blindfolded again and carried back as he had been taken; consequently, he had no idea of the route they had traversed. All at once it occurred to him that he would be as cunning as his friends; so he secretly unfastened a string of beads (or a rosary, as it is called) which he wore round his neck, and which he used for counting his prayers. These he dropped one by one occasionally, as he was being carried, thinking that when day light came he could, by means of them, find his way back to the mine. How mistaken he was remains to be seen. As he lay in bed, pleased with the thought that he would soon be very rich, and able to bestow large benefactions upon the needy, the Indian knocked at the door. "I have brought you your beads, father," said he; "you dropped them on your way."

One method of carrying the metal down the steep paths is to put it on the back of an animal called the llama—a pretty creature, a little taller than a sheep, and covered with a short, dark, course wool. It cannot travel quickly, but is very sure-footed, and although only an animal, is sufficiently sensible not to attempt to carry too great a burden. When it finds the weight greater than it can bear, it lies down, and will not rise until its load has been lightened. So useful are these gentle-eyed animals (for each llama can carry a sack containing a hundred pounds of metal), that it would be difficult to carry on the mining business without them; and, fortunately, they are very plentiful.

Troops of many hundreds of them may be seen in Peru, descending the mountains with their bags of barilla, as the powdered ore is called, each troup led by a horse, with a bell attached to his neck, to warn approaching travelers to stop at places where the road is not wide enough, or to avoid deep precipices.

In some parts of South America so many droves of mules and llamas cross the pampas, or treeless deserts, with loads of various kinds that the tract is covered with bones of animals that have died either of fatigue or of hunger. To one of these places the name of

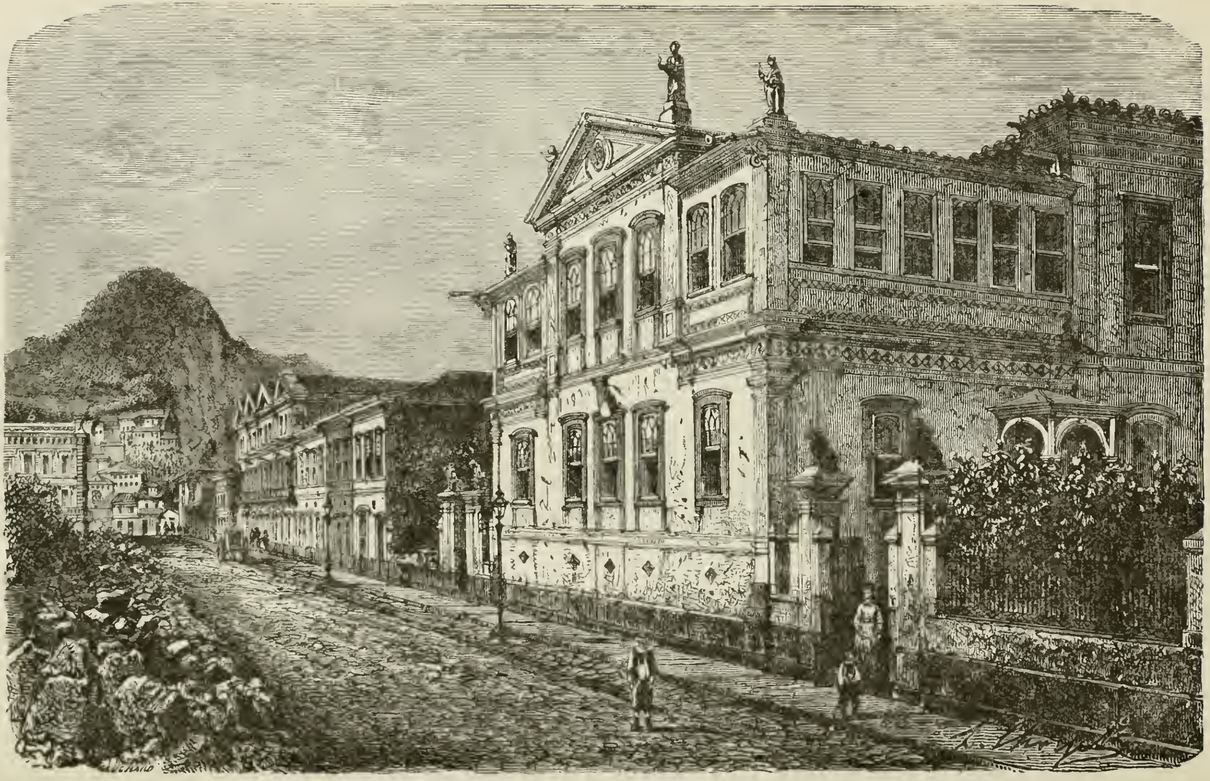
"The Tombs" has been given. The care of all these animals provides occupation for very many of the red men in South America, who have been trained from boyhood to the keeping of flocks and herds.

A traveler gives this vivid description of the wonderful beauty of the harbor of Rio de Janeiro, as it appears to those who enter it on ship-board: Just at sunrise, when I went on deck to enjoy the cool air, I heard the shout of "Land!" and looking out, I saw a line of blue mountains rising out of the water. The breeze carried us quickly towards them, and in a short time we could distinguish a lofty height, shaped like a sugar-loaf, which stands at the south side of the entrance into the harbor of Rio. A little to the left rose three peaks, called the "Three Brothers," with the lofty peak of Corcovado a little further south. On the right of the entrance we could distinguish the white walls of the fortress of Santa Cruz, which commands it, with another range of mountains rising above it, and terminating in a bold, lofty, promontory, known as Cape Frio, while far beyond towered up the blue outline of the distant Organ Mountains. We sailed on, passing between the lofty heights I have described, being hailed, as we glided under the frowning guns of Santa Cruz, by a stentorian voice, with various questions as to who we were, whence we came, our object in entering the port, to all of which our guide replied through his speaking-trumpet. It would be difficult to describe the beautiful scene in which we now found ourselves—curious-shaped canoes and boats of all rigs, manned by half-naked blacks, sailing about, and a number of vessels at anchor in the vast harbor; numerous white forts, backed by picturesque hills rising above them, covered with the richest verdure, and villages peeping forth here and there in beautiful little bays; while higher up the bay the vast city appeared, extending for miles along its irregular shore, and running back almost to the foot of the Tijuca Mountains, with hills and heights in every direction. In the midst of this scene we dropped our anchor under the frowning fortress of Villegagnon, the first castle erected by Europeans in that region.

I cannot hope to convey by words a correct idea of the beauty of the scenery or the magnificence of the harbor. All visitors agree that it is one of the finest in the world.

Rio is a large city, with heights rising about in various parts, covered with buildings. Most of the streets are very narrow, the architecture very unlike anything to be seen elsewhere. Numbers of priests; gangs of slaves, carrying loads; ladies in black hoods reaching to the feet, called mantilhas; gentlemen in cloaks; soldiers on foot and on horseback, were moving about in all directions.

The palace of the emperor is finely located, having an extensive park



THE EMPEROR'S PALACE AT RIO DE JANEIRO.

on one side, filled with fountains, beautiful walks and avenues, and shrubs and flowers, that bloom perennially. Here the royal family spend much of their time, adding to the social gayety of the city, and extending hospitality to the higher ranks of society.

There are well-built houses in the city, handsome churches, hotels and other buildings, large extensive gardens in which vegetables are grown, and at the Rio Botanical Gardens is a splendid avenue of mango-trees, which not only yield very delicious fruit, but which send forth a fragrance so strong that the air for miles round is scented with it. People with skins of all shades are parading up and down the busy streets. Wealthy Portuguese gentlemen may be seen riding about in their carriages, driven by black coachmen, who look quite contented as they sit perched aloft, dressed in their gay livery. In addition to the drivers, three or four negroes are often mounted on mules and riding behind the carriage, just by way of giving an air of importance to the affair, and conveying an idea of the gentleman's wealth.

In the busy streets, where buyers and sellers of cotton, coffee, sugar, tobacco, and other articles of commerce are trading with each other, dozens of negroes pace up and down, carrying great bales and bags of goods, most of them laughing and talking to each other, or singing their negro songs. The streets of this city are so steep that the negroes generally poise their burdens cleverly on their heads; then, forming themselves in a line, they set off running, singing as they go. At one time the noise of these singing negroes was so great that they were ordered to be quiet, not for a long time though; the masters found out that their work did not get done as quickly with the quiet negroes as with the noisy ones, so permission was given for the singing to go on.

CHARMS OF THE NEGRO WOMEN.

The women of this negro race, who assemble in great numbers in the market, are many of them quite handsome and gracefully formed. and, judging from the proud independent air which the beauties assume, it is evident that they are conscious of their charms. On their heads they wear a high muslin turban, in addition to which a gay-colored shawl is thrown around their shoulders in all kinds of fantastic styles. It is sometimes crossed over the breast, sometimes carelessly thrown over one shoulder; in fact, no white lady could excel these negro-market women in the skill they display in the arrangement of their shawls. Another purpose to which these gay shawls are appropriated is for the benefit of the negro babies; for the mothers have a plan of twisting them so as to form comfortable little cradles, in which the little creatures rock to and fro as happily as if they were by the fireside, thus releasing the mother for her other duties.

Among the mountainous regions and in the forests of South America many tribes of wild Indians are dwelling who are still in a state of uncivilization, and who delight in acts of cruelty. Of these the Boticudos are the most savage, and although many efforts have been made to conquer them, they have never yet been subdued. One favorite custom of theirs is to make themselves still uglier than they are naturally, by tearing open their under-lips and ears, and inserting pieces of wood into the rents thus made. A very remarkable circumstance to be noticed among most savages is the power they have of enduring pain. We often hear in our own country of good men and women who are very patient under suffering, but that ignorant wild men like these Indians, who have no refinement, and do not act from high and noble motives, should impose upon themselves unnecessary suffering seems rather curious These Brazilian Indians are particularly brave and strong, even while enduring excruciating pain. They never seem to lose their courage, and would much sooner rush straight on to their own destruction than turn their back on the enemy, thus proving themselves to be cowards.

SHEDDING BLOOD IN THE NAME OF RELIGION.

Some of their homes are nothing better than miserable huts, where mothers, fathers, sisters and brothers all huddle together, living much more as do the animals that they feed upon than as human beings who were made to love each other From childhood they grow up with the idea that happiness and greatness consist in the possession of bodily strength The man who succeeds in killing the greatest number of wild animals, or even the greatest number of his own fellow-creatures, raises himself at once to the rank of hero. They do not understand that the truest bravery consists in resisting evil, because they have no true idea of what evil is, or what goodness is. What religion they have teaches them that there are two gods—one a good god; the other a bad god The good god, the Indian thinks, helps him in whatever he wishes to do, whether the action be good or bad. Supposing he were to succeed in killing his own child, he would say the good god had helped him to do so; instead of that, if he were prevented in an act of cruelty, he would say the bad god had been working against him. Warmth, food and pleasure are supposed to come from the good god, while cold, pain, failure, hunger, and even death are thought to be sent by the bad god. The South American Indians believe that the bad spirit is stronger than the good spirit, so they spend a great deal of time and thought in preventing him doing them any harm. They seem to hold the idea that by some means or other he must be kept in a good temper.

One precaution against evil, among many other very absurd ones adopted by the Indians, is to be supplied with what is called a medicine bag. From its name we might be led to imagine that the bag contained physic of some kind, but the word medicine means to the Indian mystery, not physic; and certainly it is very mysterious that a bag made of the skin of some animal, as these bags always are, should have the power of charming away evil and danger.

Indian boys, therefore, as soon as they are about fifteen years of age, start out one day in search of some wild animal, which they must kill, and afterwards make their medicine bag of the skin. The size of the bag, perhaps, depends upon what animal happens to be chosen for the purpose; for the bags are of all sizes, and the skins of all kinds of animals are used—sometimes that of a buffalo, a wolf, or even of a rat. When the bag is once made, the boy is very careful not to lose it; for if he were to be so unfortunate he would have to be prepared for disasters of all kinds, and as to making a new one, that would be out of the question. Medicine bags are sometimes lost, of course, however careful the owners may be; but in such cases the unlucky person, who is not allowed to supply himself with a second new one, tries to steal one from an enemy, and if he should succeed in doing this he is looked upon with greater respect than he was before he lost his own.

Not only are there medicine bags among these Indians, but there are also what are called medicine men; and the title is one of very great honor, because it is only given to those of their number who prove themselves to be very wise or powerful. It happens sometimes in their country that there is no rain for many days; so after waiting for a long time, until the people begin to fear there will be no harvest, one of them declares that he will make the rain come. Accordingly, he goes up a high hill or mountain with a lance in his hand, and there he points to the clouds, pretending to pierce them, shouting to them all the time and entreating the rain to descend. If when night comes there should still be no rain, some one else takes his place next day; and thus they go on until the rain descends, when the man whose turn came last in the business gains the title of medicine man, and is greatly honored by all the rest, who ascribe to him power over the elements of nature.

A BEASTLY LOOKING DOCTOR.

A traveler gives this description of one of these medical jugglers: There was a poor Indian who had been accidentally shot, and as he lay dying his friends sent in haste for the medicine man. On making his appearance he was covered with the skin of a yellow bear, he had a bear's face stuck over his own, and all kinds of strange things were hanging about him—such as skins of snakes, hoofs of deer, birds, bears' claws, animals' tongues, tails, and teeth; in fact, he looked most frightful. In one hand he held a rattle, made of a number of bones strung together, and which made a great noise as they knocked against each other; in the other hand he waved a spear, and as he approached the spot where the sufferer lay he grunted and growled like a real bear, jumping and frisking about in a very ridiculous manner. Then, when he reached the Indian, instead of soothing or trying to cure the poor fellow, all he did was to drag the wounded man about. Of course the sick man could not bear such rough treatment, therefore we are not surprised that in a few minutes he was dead; and though the friends standing round appeared quite satisfied with what had been done, it is difficult to discover any good that had been accomplished in any way by the wonderful medicine man. More difficult still is it to understand how special wisdom and power should be imagined to exist in a human being capable of acting so foolishly.

However, these savage tribes are gradually growing smaller in numbers; but the few of them that still remain in South America, especially the Boticudos, hate their conquerors, the Portuguese, and watch every opportunity of shooting at them or doing them harm in other ways. Like all selfish, quarrelsome people, they imagine that every man's hand is against them; therefore they regard all white men as their enemies. Sometimes they hide among the trees, and cleverly send their arrows at any white travelers, or even at negroes; indeed, they hate the African negroes more than the white men, and whenever they can do so they both kill and eat them. Many of these Indian tribes live in the treeless regions, of which there are so many both in North and South America, as well as in Europe and Asia.

Either from fear or dislike of the white men who from time to time have arrived amongst them, most of the Indians have fled to the mountains and plains and forests, so that there, unmolested, they may lead the old life to which they have always been accustomed.

THE NATIVES' MANIA FOR DRESS.

In all South American towns in which settlements are made by civilized foreigners, the negroes and dark-colored natives live in districts of their own, quite distinct from those occupied by the white people. When at the very first the English people made their home in Guiana, the negroes took no trouble to adorn themselves with dress of any kind, but would wander about doing their daily work almost naked. The masters and mistresses who employed them to do certain kinds of work insisted, therefore, that clothing should be worn by their servants, and in order to reconcile them to the new custom, would frequently give them old clothes of their own that they had done wearing, including often various articles of finery.

Very comical it was sometimes to see the black women especially dressed in the garments with which they had been presented. The novelty of their appearance seemed at first only to amuse them, but by degrees, as the freshness of the affair wore away, they began to show the usual signs of womanly vanity, and would imitate the manners and appearance of their mistresses, imagining, no doubt, that they had succeeded in making themselves quite as attractive as any white lady. Not only the women but the black men also looked very ludicrous dressed up in their masters' old clothes. The common dress, however, now generally worn by the negresses and mulatto women is much like that of white people. Their dress consists of a piece of stuff or muslin known by the name of gaule, folded gracefully round the body; and the peculiar head-dress worn by them consists of a handkerchief fastened turban-fashion round the head.

This Madras, as it is called, is so universally adopted by the natives of Guiana that it may almost be regarded as a national peculiarity, and yellow is the color usually chosen for it—the color of gold or of the sun—while in others are united all the colors of the rainbow, woven into gaudy and elaborate patterns. A casual observer might imagine that there was but one method of arranging their gay head-dress, but in reality almost every wearer adopts a different style. The policeman puts on his turban one way, a soldier another, and ladies have so many different methods that it would be a very long time before we could understand them all. The fact is, they arrange their Madras to suit the temper they happen to be in at the time. If they are feeling very sad, they give it a certain twist, which means "I am very miserable;" if they are joyous, the handkerchief assumes another shape, which means "Look how happy I am;" if they have been offended, another form is given to it, meant to imply "I am very angry." So that these head-dresses are really very useful articles of attire, as well as being what their owners consider them, exceedingly ornamental.

The natives of Guiana, like the rest of the South American Indians, are, although ignorant and savage, in some respects both clever and ingenious; and as to bravery, like most other Indian tribes, they would never think of turning their back upon an enemy, or of trying to escape pain. It once was the custom among one of their tribes, called the Caribs, of whom not very many now remain, that when a captain was chosen, in order to prove his powers of endurance he was for a certain time exposed to a mass of biting insects. His suffering in consequence was intense; but if he bore it bravely, he was chosen as captain, and the rest of his tribe laid at his feet their bows and arrows, to show that they would henceforth obey his commands.

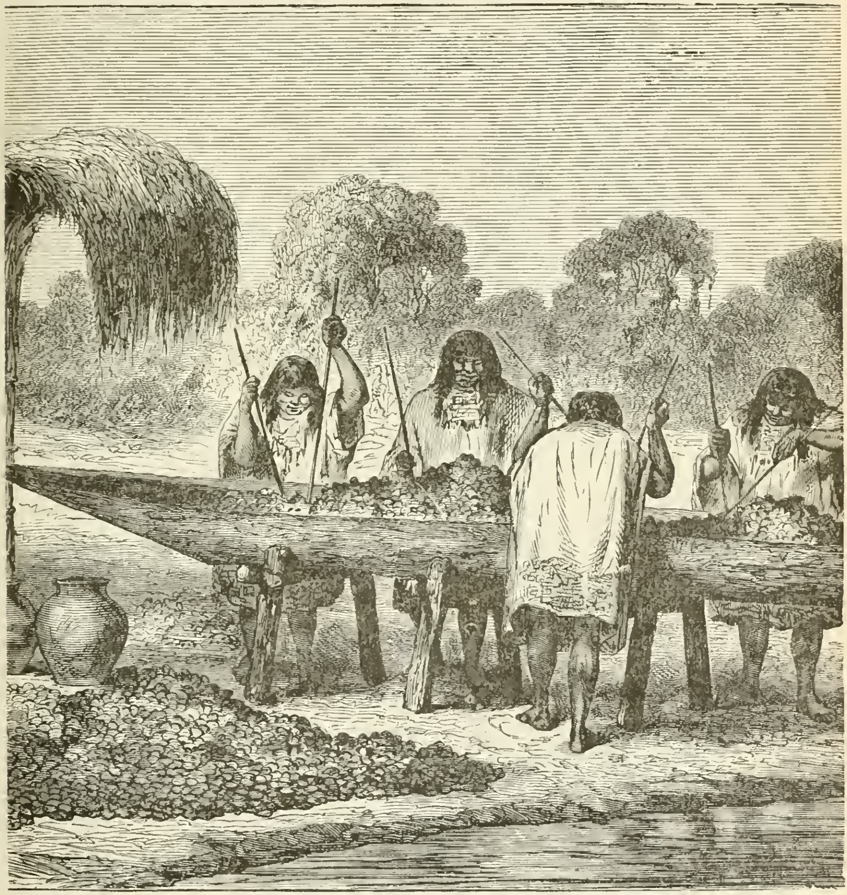
They believe that all created things came from the branch of a silk cotton tree, cut down by the Great Creator, excepting the white men, who sprang from the chips of a tree; they therefore are of little value.

They believe also that at one time there was somewhere a very large tree on which grew every kind of flower and fruit that has ever been known, and that all the flowers and fruits we have now came originally from that large tree. The tree must have been gigantic; for they say that in the middle of it was a large reservoir of water, in which were all the fishes, and that one day a mischievous monkey amused himself by letting loose the water, and that consequently the world was flooded.

The love of finery is as strong in them as it was in their ancestors. Most of the Carib women wear, just above the knee, and above the ankle of each leg, a tight cotton strap painted red. This strap is put on in childhood, and as the girl grows is only taken off to be replaced by a new one; the result is that their legs become ugly and unnatural, though the women themselves are very proud of them Another strange custom of theirs is to make a pin-cushion of their lower lip, by sticking into it two or three pins, which when they want to use, they take out, and then put them back into the same place. At one time, before they could get pins, they used thorns for the purpose instead. The cloth worn round the waist by the men is sometimes long enough to be thrown over the shoulder, and made to hang gracefully down the back. In that case it is often ornamented with tassels, the owner at the same time having his body painted gaudily, and wearing on his head a crown of feathers, so that in his own estimation at any rate his appearance is truly magnificent.

There are to be found on this coast great numbers of turtles, which as an article of food the natives regard as a very great delicacy. A very favorite occupation of theirs is for a number of them to set out with their steel-pointed arrows to the edge of the water, there to lie in wait for turtles. They are so accustomed to the business that, without waiting for the fish to make its appearance, they can tell by the appearance of the water the exact spot where one is quitely paddling along, and often shoot their arrows quite a long way out exactly on the turtle's shell. By means of a long piece of twine fastened to the arrow the Indian manages to draw the animal to shore, when, if it should not be quite dead, he strikes it with a second arrow. The turtle pools abound sometimes with ugly red leeches, which fasten on the legs of the fishermen, much to their annoyance.

Better still, however, than the turtles themselves are their eggs; and as each turtle lays about one hundred and twenty eggs, there are plenty of them to be found, to say nothing about a great many that are not found by the fishermen owing to their being laid in places where they are not looked for. The turtles lay their eggs by night, leaving the water in vast crowds when nothing disturbs them, and crawling to a high part of the shore. With their broad webbed paws they dig deep holes in the fine sand. One turtle goes first, and after making a pit about three feet deep, lays its eggs and covers them with sand. Another then goes, and lays its eggs on the top of those of its companion, a third does the same, and so on, until the pit is full. For a whole body of turtles to lay their eggs in this way it takes fourteen or fifteen days, and when all have done, the space where they have been at work is distinguishable from the rest of the ground only by the sand having a rather rougher appearance than usual.



CARIB INDIANS MASHING TURTLES' EGGS.

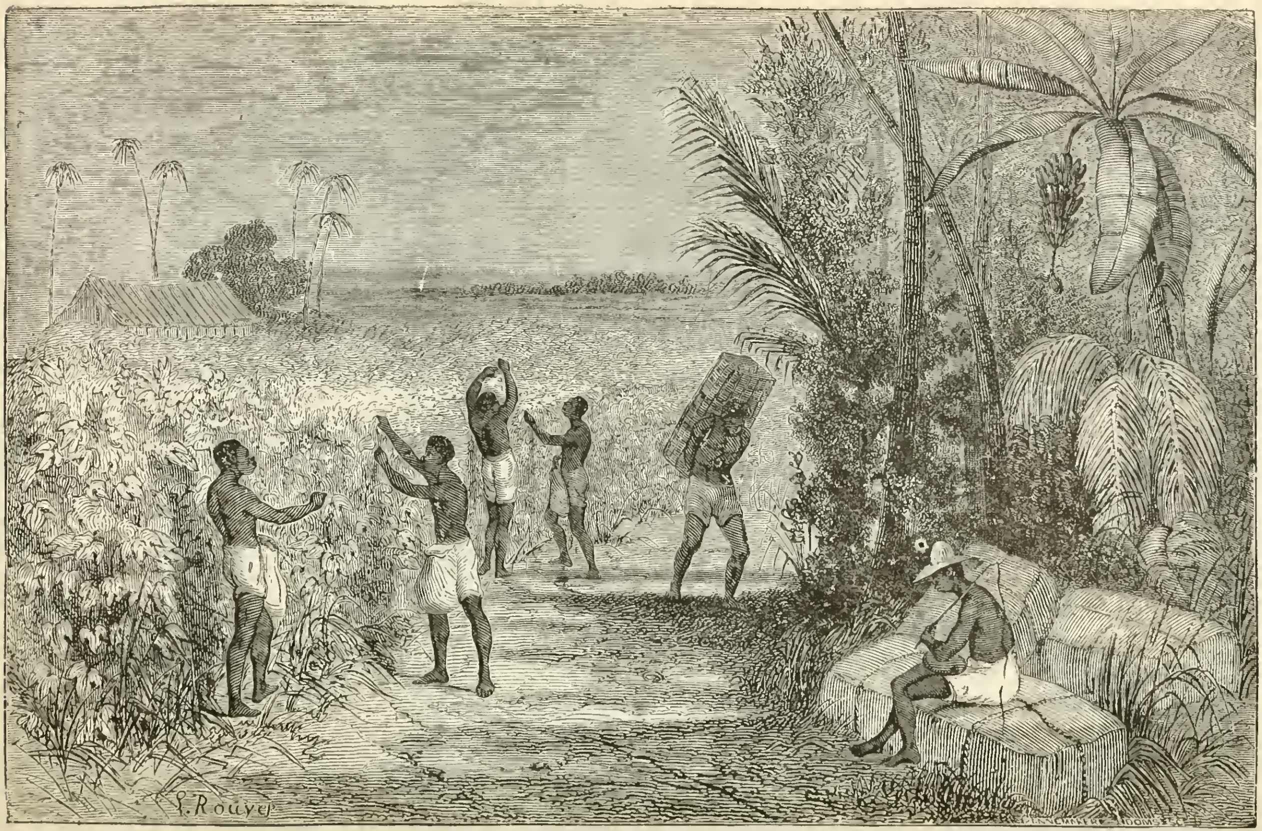
After having laid their eggs they waddle back to the river, looking, when there is a multitude of them, like a great black cloud moving along the sands; and down they tumble head first into the water. The eggs are especially valuable on account of the oil that is extracted from them, and which is used in different parts of the country for lighting, for frying fish, and other purposes. First of all, the eggs, which are quite round, have a leathery shell, and are a little larger than a hen's egg, are thrown into a large tub, or perhaps an empty canoe, and are mashed with wooden prongs. Or, instead of that, sometimes naked Indians and children jump into the mass and tread it down, besmearing themselves with yolk, and making a scene anything but pleasant. The beating process finished, water is poured over the mass, and it is left for a few hours to be heated by the sun, when the oil separates and rises to the surface. With long spoons, made by tying large mussel shells to the end of rods, the floating oil is then skimmed off, and purified over the fire in copper kettles, when it is ready for use. The Indians say that at one time the waters teemed as thickly with turtles as the air does now with mosquitoes, in that part of the world; but, owing to so much oil being made from the eggs, and also owing to a great many of the newly hatched young ones being eaten by vultures and alligators, there are not nearly so many left as there used to be.

THE CULTIVATION OF COTTON.

There is great luxuriance of vegetation in many parts of South America. One of the products is cotton. The shrub grows in many countries. It is found in America, in India, China, Persia, and Sicily. A writer who lived in very old times, when America was overgrown with forests, says of the cotton trees: "There is a plant which does not bear fruit, but cotton; and the people make their clothes of it."

The flower of the cotton tree is white, and the leaves are a dark glossy green. The seed or pod bursts when it is ripe, and then the owner of the cotton plantation knows that it is time to bestir himself. Men, women and children come into the fields before the sun rises. If the sun shines on the cotton it will turn yellow. Sometimes they take off the whole of the pod just as it is. In other places, they take out the cotton and leave the pod behind. The product now looks like a white pulp, and is mixed with the seeds that have come with it out of the pod. The first thing to be done is to get the cotton away from the seeds. This is very tiresome to do, and takes a long time, if the men do it by hand, that is, without the help of a machine.

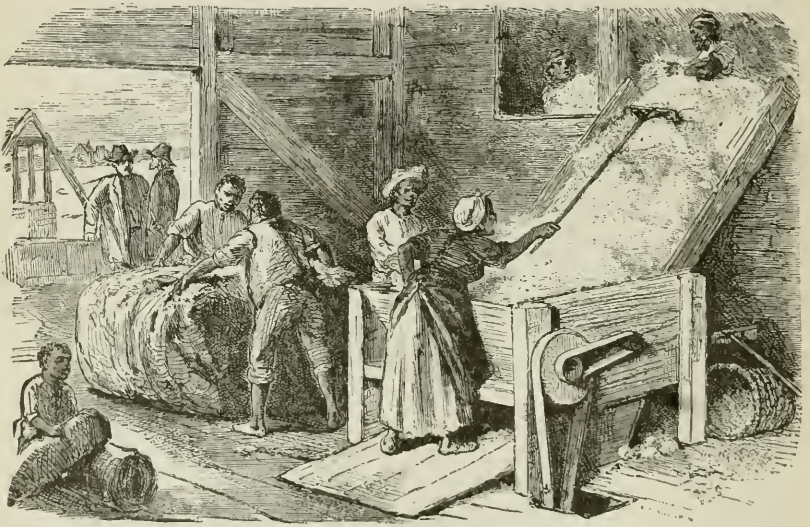
In India, all the cotton is picked by hand. A man can gather only about a pound of cotton in a day which is very slow work. In other places people use machinery. In this country the planters have a very large machine, which can cleanse, or separate from the seeds, three thousand pounds of cotton a day.



CULTIVATION OF THE COTTON PLANT.

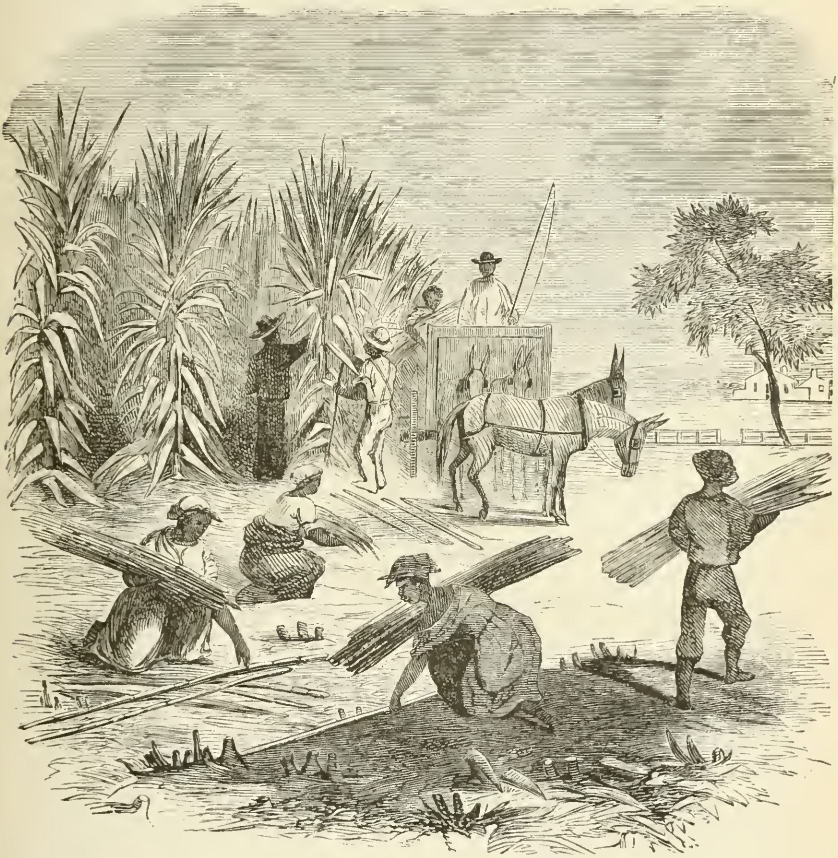
Formerly the process of separating the pulp from the seed was very slow, being performed by hand or rude machinery. In 1793, Eli Whitney invented the celebrated cotton gin, now in use, which has justly been considered one of the most important triumphs of mechanical genius, as it cuts away the seed by a system of revolving saws, and by a series of brushes frees the pulp from fragments of the seed, thus preparing it for market, thus not only saving a vast amount of labor, but giving to the product a finer quality.

One South American industry is the cultivation of the sugar-cane. When they are cut and tied in bundles the canes are quite ripe, and are full of a sweet juice. To squeeze this juice out, the canes are put into a mill. The mill is nothing more than two great rollers, and as the juice is squeezed out, it runs into a kind of cistern beneath. Then, it has to be boiled directly, or else it goes sour. The juice becomes a thick syrup with being boiled. It is put into shallow basins to get cool, and as it cools, it becomes sugar, and is packed into great tubs; holes are pierced in the bottom of the tubs, and the molasses is allowed to drain away. When this is done, the sugar is ready to be shipped off to other countries. Large numbers of natives are employed in this branch of labor, which is a source of vast wealth.



AN OLD-FASHIONED COTTON GIN.

Through the north of Brazil flows that immense river, the Amazon, which is the largest river in the world, and which is so famed for its beauty. Along its banks, stately, graceful trees wave their luxuriant branches. Parrots, with lovely crimson and gold feathers, chatter and gleam among them, and monkeys chase each other, and gambol to their hearts' content. The voyagers who sail down its lovely waters as they lie in their hammocks, with the fine fresh sea-breezes streaming in upon them, are surrounded by some of the most beautiful pictures imaginable. There are to be seen numbers of little islands covered with palm and other trees. So close to each other some of these islands are, that a child standing on one could easily throw a stone to another. Among them birds with gaudy plumage are fluttering, while below them numbers of flowers are thickly strewing the ground. The scene altogether from the vessel is like one immense dissolving view, for the reason that every minute the picture changes. Huts belonging to the natives are occasionally to be seen on the water's edge, many of which, to preserve them from being washed away, are well supported with large stones.



GATHERING SUGAR-CANE.

Sometimes during heavy storms a whole island is washed away in little more than a few minutes. It happened once that some travelers, during a storm on the Amazon, had fortunately taken shelter on an island so full of high spreading palm trees that their branches formed quite a strong, spacious roof, and served as a protection from the storm. Seated in their canoe, and while waiting for the storm to subside, the travelers actually saw the little island of Jahmna, which was three miles in length, entirely disappear. The tremendous waves rushed over it, swamping all the low trees and plants until nothing could be seen of them. Some very old trees that had stood the storms of many years struggled very hard for life. They appeared almost to be saying, "We and the tempest will try who are to be the conquerors;" but after a brave fight their roots were torn up, their graceful branches strewed hither and thither, and in a very few more minutes the waters roared over the spot just as if no island had ever stood there.

Of all South American trees, perhaps the palm-trees are as remarkable as any other, for the Indians make use of them in so many ways that they are evidently regarded as an absolute necessity. They do not grow in every part of the country; miles of forests may be passed without a single palm being seen, while in other parts they grow in great numbers. On river banks especially they abound, bending over the stream and waving their beautiful leaves in the breeze. There are very many different kinds of them; some are only a few feet high, called dwarf trees, while the great mauritia palms of the Amazon are more than one hundred feet high. One traveler tells us that he measured one that was one hundred and ninety-two feet high. Some are stemless, consisting only of a spreading crown of large leaves, and one palm bears fruit that hangs in such large bunches that it requires more than one strong man to carry a single bunch. The leaves of the trees are so large that the natives thatch their huts with them, and the leaf-stalks, often fifteen or twenty feet long, are used as rafters, or, when fastened together with pegs, form doors and shutters. In fact, there is a special kind of tree for almost every want of the red man; he has one for his bows and arrows, another for his blow-pipe, and one from the leaf of which he makes a cradle for his little black baby, a hat for himself, or even a wrapper. Numberless articles of food also are produced from palms, such as bread, oil, sugar, salt, fruit, and vegetables. The famous betel nut chewed by the Malays is the fruit of what is called the areca palm; it is esteemed as highly by them as the coca leaf is by the Bolivians, the opium is by the Chinese, or as tobacco is by Americans.

The cow-tree also we must not forget to speak about, for it is one of the largest of the forest monarchs, and is peculiar in appearance on account of its red ragged bark. The fruit it bears is very delicious, and is sold in the streets by the negro market-women, but what is most wonderful is that sweet milk is drawn from the wood, even from dry logs that have been standing for many days in the hot sun, though if left to stand long it becomes very thick, like glue; in fact, it is often used as a cement for mending crockery, and is very good for that purpose.

THE FAMOUS INDIA-RUBBER TREE.

From another tree called the seringa we obtain that useful substance called india-rubber. The men who are engaged in extracting the liquid earn very good wages for themselves, if they choose to work well and be industrious. They often begin very early in the morning, and the plan they adopt is to cut a hole in one tree after another, leaving under each one a jar to catch the milky substance; so that in a few hours they are able to get quite a large quantity, all of which has to be dried in the sun before it is fit for use. Hundreds of Indians build their huts close to the banks of the river under the shade of the high trees, and gain their livelihood by collecting the sap. With a sharp knife they split open the bark of the tree, when out flows the milky substance, which, when dried in the sun, makes india-rubber; the smoke-drying process by which it is hardened accounts for its black appearance as we see it.

At one time the provinces watered by the Amazon were called the country of the Amazones, though, strange to say, those great brave women called the Amazones who brought up their girls to be warriors, and either killed their boys or sent them away, did not live near this river Amazon, as we might have supposed, but in the far-off east. Many other lofty trees grace the banks of the Amazon, and not far from the coast are thick plantations of cacao trees, which supply us with the chocolate and cocoa we use. Most of these plantations belong to rich Portuguese gentlemen, who have built for themselves handsome houses along the river's banks, and who lead an easy, idle kind of life. They keep plenty of black servants to attend to the plantations, and once a year, when the fruit is gathered, all are hard at work as we are at harvest time. After being gathered the fruit has to be cut open, the pips are then taken out, dried in the sun, packed up, and put into ships that are bound for other lands.

Coffee, also, is very extensively grown in Brazil. It is said to have been first introduced there about the middle of the eighteenth century, and now in some of the Brazilian provinces immense forests of coffee-trees flourish, and the owners of them think there is no coffee in the world equal to theirs. In order to make a coffee plantation, or a fazenda, as it is called, the owner first of all sows his seeds, and leaves the young plants for a whole year to develop. At the end of that time his servants gather them very carefully, and transplant them into another piece of ground, where, after being carefully tended for three years more, they begin to produce berries, bearing more and more every year, and sometimes as many as two crops in one year. After doing this for thirty years, both the trees and the soil seem to have exhausted themselves, and new plantations have to be made. On being gathered the berries are white, and have to be dried in the hot sun, or baked, before they receive the rich brown color that is so familiar to us.

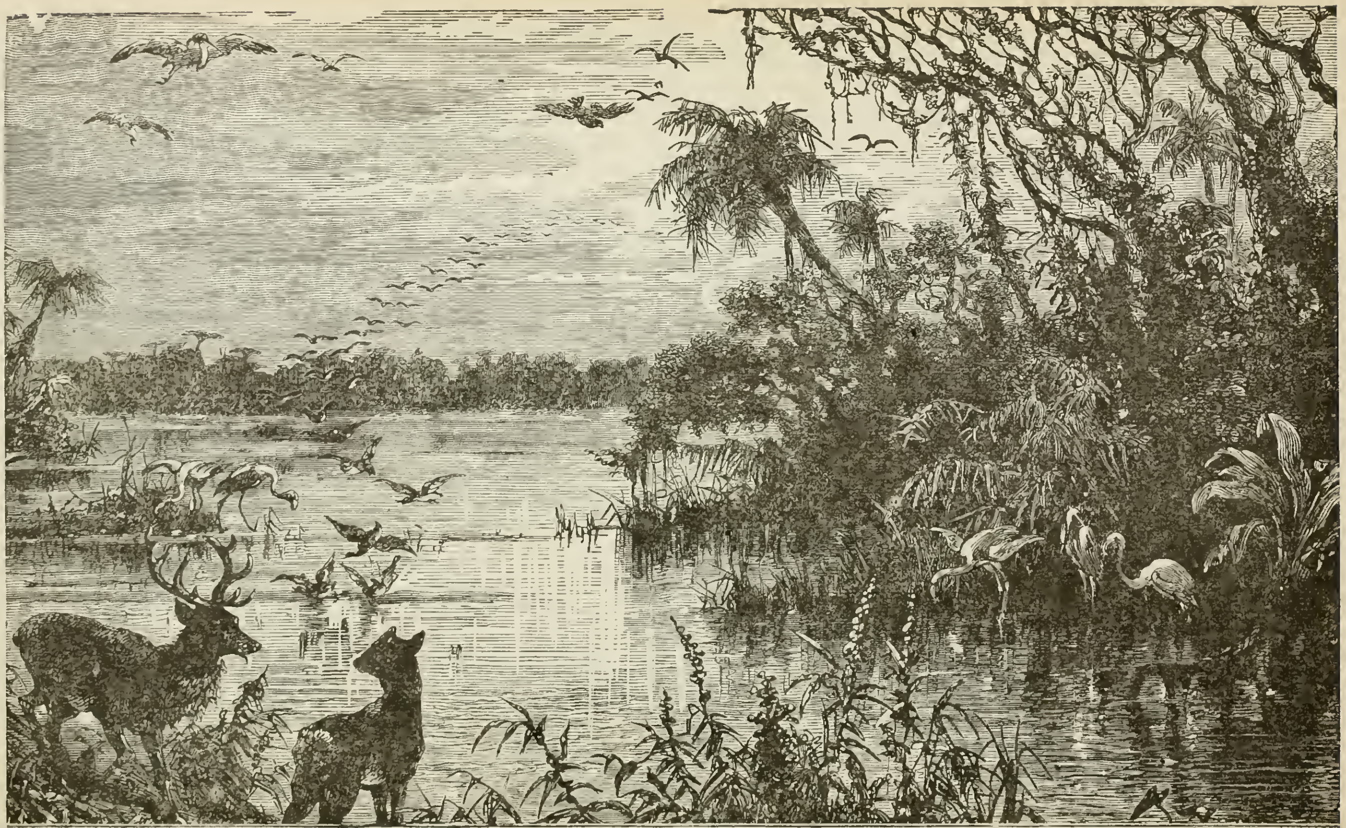
TREES OF IMMENSE SIZE.

The whole of Brazil, in fact, is famous for the great size and number of its trees, most of which are made useful in some way or other by the natives. There is one favorite nut-tree of the Indians that grows to the height of a hundred feet. In summer its branches are covered with rose-colored leaves and white blossoms, and in autumn nuts as large as a canon ball are hanging from its branches. The Indians take the precaution of keeping away from these nut-trees during a storm; for if the fruit were to fall on the head of some unfortunate fellow, the result would be anything but agreeable, however thick and woolly his hair might be. As a proof of the great size of these Brazilian trees, a canoe that belonged to a missionary was made out of a single tree, and measured thirty feet in length and five in. breadth; and from a single trunk of the wild cotton-tree canoes have been built large enough to contain a hundred persons; while the leaf of a certain palm-tree affords a shade to five or six men. It seems, however, that the strength of them is not equal to their size and beauty. Reared in a warm climate, they are like hot-house plants; and, unlike our sturdy oak, that is so strong and so deeply rooted that it can stand erect in a furious tempest, these graceful foreign trees, with their roots extending only a little way below the surface of the earth, are often blown down by a strong breeze; and as they fall they frequently destroy many others with them.

Round some of the large trees grow parasitical or climbing plants, called lianes, the branches of which twine round the trunks of large trees, forming very often perfect galleries or canopies of flowers; though in some parts these parasitical plants grow so thickly that the forests are rendered impassable by them, and their tendrils so cover the tops of the highest trees that all foliage and flowers but their own are almost entirely hidden. These creepers twist round thick trunks of trees, and round slender stems, hanging sometimes in loops from the branches, or perhaps stretching themselves from tree to tree. Where their root is, or how they grow, is quite a puzzle. These wild climbers start up from some unknown corner and cling round the first shrubs or trees that happen to be near, clinging so tightly, too, that it is difficult to tear them away. Some of them are slender and smooth; others are rugged and knotted. Very often a number of them are twined together, so as to form quite a thick cord, and are used by the Indians for cables, to bind the wooden anchors they use. Indeed, they are made to serve almost every purpose for which we should need a rope or chain. The Indians are so well acquainted with these forest ropes that when in want of one they take their choice among them, according to the use for which it is meant to be employed. Some of them will bear twisting and tying; some will last longest in salt water; others in fresh water. With one kind the planks of boats, and even of large sailing vessels, are bound; and they are useful in numberless other ways.

When the branch of a tree falls, creepers are often left hanging in the air. If so, they blow about wildly for a little time, then, as if resolving not to despair because one friend has forsaken them, they throw out their tendrils and catch hold of other trees growing beneath them, and round these they are very soon as tightly clasped as they were round their lost friends. As if to prove their gratitude for the support given them, they sometimes burst out into lovely blossoms, thus ornamenting with delicate tinted flowers tall, strong, stately trees upon which nothing but leaves are ever seen; but, strange to say, in the shade of the forest the climbers flower very rarely. Hundreds of other trees also are to be found in those grand forests, all of which are made useful in one way or another by the inhabitants; and not to them only are all these trees useful, for we also, who live so far away, derive untold benefits from the vast wooden treasure-houses of South America.

A traveler gives this graphic description of Brazilian scenery: We forthwith set out, and descending the mountain, were soon in the midst of the thick forest. Two of the Indians, who carried lighter burdens than the rest, went ahead with axes in their hands to clear the way. It was extraordinary with what rapidity they cut through the sipos, or hanging vines, which threw their serpent-like coils from tree to tree. So quick is their growth in that moist region, that other travelers following in a few weeks would have to perform the same operation. As we advanced the forest became thicker and thicker, the dark foliage forming a lofty vault through which no sunlight can ever enter. The air felt cool and excessively damp, compared to the exposed sides of the mountains. A constant mist seemed to hang on the branches. The stillness and gloom, indeed, became almost painful. From the lofty trees hung down thousands of lianas, or air-roots, some forming thick festoons, others perfectly straight, of all lengths, many reaching almost down to our heads, others again touching the ground and taking root in the soft earth. Here and there some giant of the forest, decayed



A REMARKABLE FOREST SCENE IN SOUTH AMERICA, by age, had fallen, to remain suspended in the loops of the sipos. Thus we went on, following in Indian file.

We had thus been progressing for some time, the only sound heard being that of our footsteps on the rustling leaves, or that produced by the sharp axes of our pioneers, when suddenly our ears were startled by a loud crash, which, contrasted with the previous silence, made it seem as if the whole forest was coming down together. In a short time the crashing sound ceased, and directly afterwards we came in sight of a vast trunk, which had fallen across the path we were about to pass along. We had to make a circuit therefore to avoid it. We could not but feel thankful that it had not delayed its fall till we were passing beneath, although we might possibly have had time to escape, in consequence of its being upheld for a few seconds by the sipos, till its vast weight had dragged them down.

A TERRIBLE VOLCANIC ERUPTION.

The highest of the volcanoes is Cotapaxi, from which at different times there have been eruptions, when the cinders and fragments of rock sent out by it have covered the valleys around to the extent of several leagues. In 1758 the flames of the volcano rose two thousand, seven hundred feet above the edge of the crater, and in 1744 the roaring of the mountain was heard as far as Honda, six hundred miles away. Another time, in 1768, the quantity of cinders sent up from the mouth of the volcano was so great that until mid-day the sky was darkened with them. After this, for twenty years it was quiet; then it burst out again as furiously as before. The old Mexicans gave the name of Popocatepel, or "the Hill that Smokes," to a volcano in their country, and looked upon it as a god. They had a mysterious dread of it, and told the white strangers in whispers that no man could ascend its slopes and still live. The Spaniards laughed on hearing this, and resolved to find out what there was to fear. Accordingly, ten of them began ascending the steep sides of the mountain, taking with them as many Indians as they could persuade to join them. On they all went happily for some time, until they came to where no grass was seen growing, nor any trees, nor any vegetation of any kind, but where strange noises were heard like distant thunder. The Indians then looked alarmed, and set off back again with all speed, thinking to themselves how foolish the white men were to rush as they were doing into such great danger. Left to themselves, the ten brave Spaniards continued their way, over the black, glazed sand, and through the chilling air, until they reached the region of perpetual snow, and found themselves among glittering, treacherous glaciers and crevasses, and with huge slippery-pathed precipices yawning around—a great change for them, when it had been warm, bright summer not many hours before at the foot of the volcano. Not daunted, however, they pressed on.

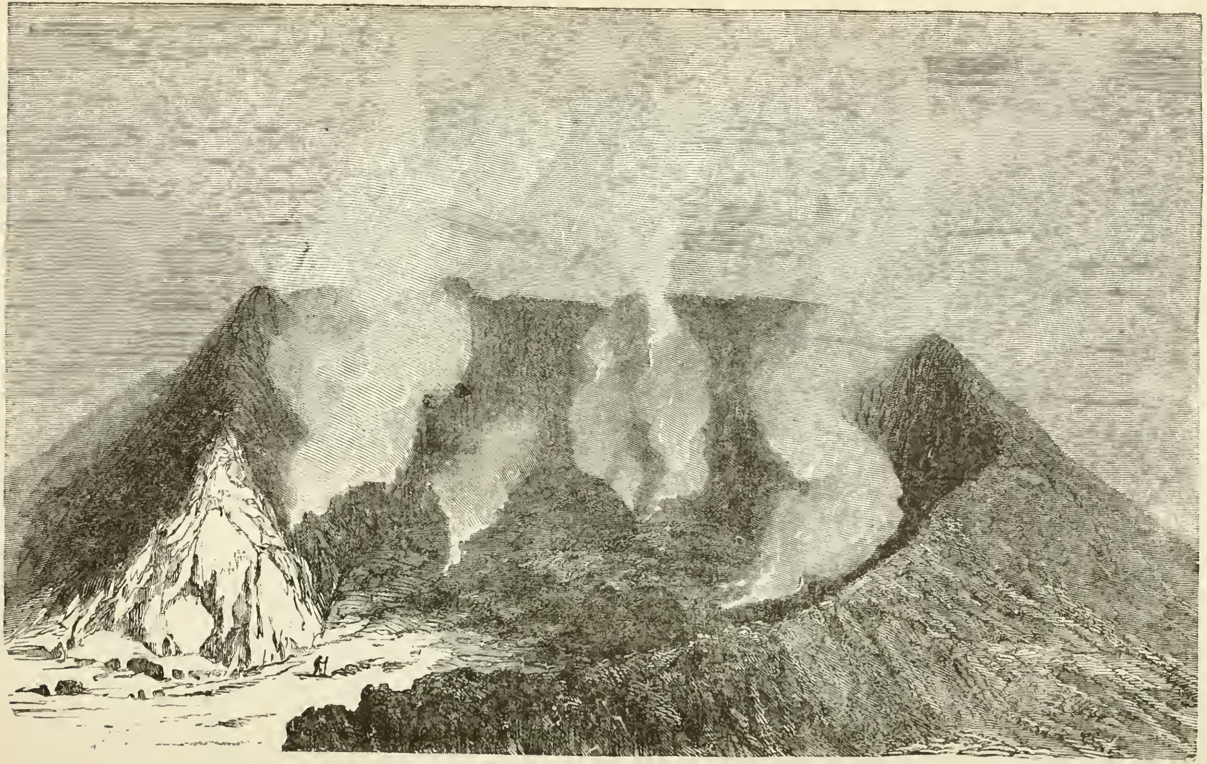
In the ascent they had made but slow progress. This was not surprising, considering that they had to climb up rugged steeps, and to descend again into deep valleys, to cross rapid streams and wade through morasses, again to mount upwards and wind round and round numberless rugged heights, with perpendicular precipices, now on one side, now on the other, and gulfs below so profound that often their eyes, when they unwisely made the attempt, could scarcely fathom them. Still almost interminable ranges of mountains appeared in the distance. The patient mules slowly climbed, and, the summit reached, the ridge was so narrow that parts of the same rocks might have been hurled, the one down into the valley towards the setting sun, the other in the direction of the Atlantic. They there stood fifteen thousand feet at least above the ocean, their animals panting with the exertion, and themselves, though inured to the air of the mountains, breathing with difficulty. Still before them there was a scene of wild grandeur—mountain rising beyond mountain, with deep valleys intervening, their bottoms and sides clothed with a dense, unbroken mass of foliage.

All at once they encountered a fierce storm of ashes and cinders, the air was filled with the flying mass and was almost suffocating, and their only hope of safety was in precipitate flight. No time was to be lost.

They were nearly an hour descending, their mules carefully picking their way among the rocks and lofty trees, and along the edges of yawning chasms, which threatened to swallow them up. Sometimes they passed through wooded regions, where the giant trees, falling from age, remained suspended in the net-work of sipos or wild vines, which hung from the branches of their neighbors. Now they had to make their way round the trunks, now to pass beneath them. As they looked up, they could not help dreading that the cordage which held them might give way, and allow them to fall at that instant and crush them. At last they reached a level spot or terrace on the mountain-side, but still the bottom of the valley seemed far down below them.

CAPTURING WILD HORSES.

A considerable portion of La Plata or the Argentine Republic, consists of large plains called the pampas, which in reality are the prairies of South America; though sometimes the term is meant to signify any tract of level land, wherever it may happen to be found. These pampas are the homes not only of thousands of animals, but also of the Gauchos and the wild Indians, the former of whom are a race of wild Spaniards well known in this district of South America, and who are the peons, or laborers, employed by large owners of horses and cattle.



NEAR VIEW OF THE MARVELOUS VOLCANO'S CRATER.

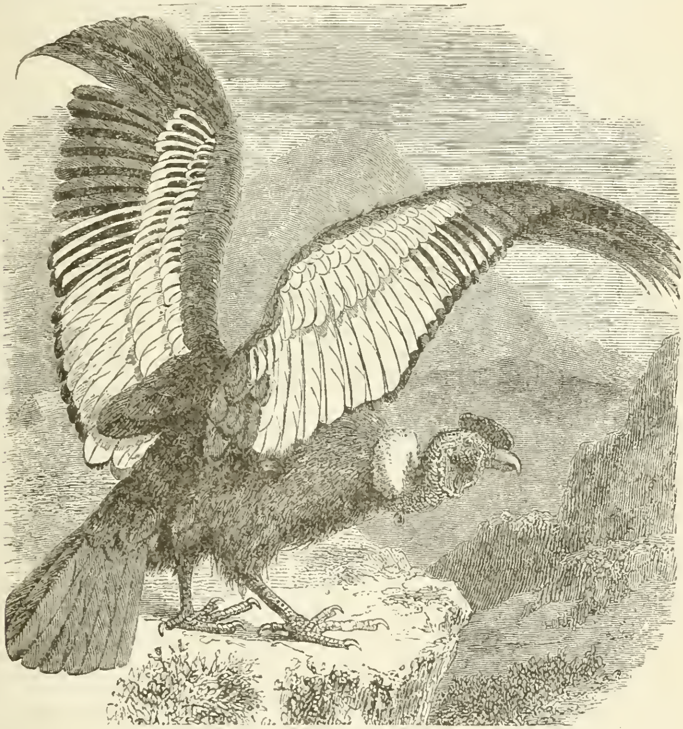
Their work is all done on horseback; for there are so many horses in South America that they run wild, and are not only used as beasts of burden, but are eaten by the inhabitants. The huts of the Gauchos are made of mud thatched with grass; and very often the cradles of the babies are bullocks' skins swung to the roof. Their work is nearly all performed on horseback, and as they boldly scamper across the pampas, holding in their hands the lasso and bolas (ropes with weights attached to each end), with which to catch the different animals they pursue, they appear to be thoroughly happy. As soon as one horse is tired they catch another, and tire that out also. Like most ignorant people, however, they are often very idle; so instead of taking the trouble to cultivate the ground, in order to be supplied with vegetables for food, they live entirely upon the wild animals they catch. Some of them are very musical, and are as delighted to sit playing their guitars as their companions are to hurl their lassos. They generally wear large, soft hats, cloaks called ponchos, which are pieces of woollen stuff covering the back, chest, and arms, trousers of a bright, showy color, a leather belt, and large boots adorned with silver spurs. Bold, wild, cruel men most of them are, and by no means such as any of us would like to meet alone in a thick forest.

The vast plain of the pampas may be divided into three portions. First, the land of tall thistles, which wither every year, when rich clover springs up in their place. Then the land of long grass; and this pampas grass is very different from any that is seen elsewhere. It consists of coarse tufts of hard, dry grass, which cover the yellow clay like thousands of little islands. In the distance the spaces between these little tufts cannot be seen, so that the pampas look like a great lawn, and in autumn, when the seeds of the grass are ripe, they look quite white; so that the large plain is like a great ocean covered with gently rolling silvery waves. Then lastly there is the land of low trees and shrubs, which grow in great profusion and variety.

ANIMALS AND BIRDS.

Among the animals that frequent the pampas are the viscachas, animals about the size of squirrels, and which are as much dreaded as the prairie dogs are in North America, for the reason that they burrow into the land so much that it is quite dangerous to travel on the plains after dark. Horses, mounted by Gauchos, very frequently stumble in the holes made by them. The armadillo, the hare of the pampas (a kind of guinea-pig), the beautiful Argentine skunk, rats, mice, tiger-cats, deer, pole-cats, the ugly river-hog, the puma, the jaguar, and serpents of all kinds in abundance, dwell in these wonderful regions.

As to birds, too, there are plenty of them, from the tiny humming-bird to the huge ostrich, so many of which are to be found in Patagonia. The condor, also, sometimes finds its way to the pampas, though, as a rule, it makes a point of keeping near its much-loved mountains. Strange tales have been told about this remarkable bird. Some old travelers once said that his plumage could not be pierced by a musket ball—an absurd idea, founded, no doubt, on the fact that it is generally a very difficult business to kill him, on account of his plumage, especially on his wings, being so strong and thick. The natives, therefore, seldom attempt to shoot the condor. They usually catch it by traps or by the lasso, or kill it by stones flung from slings, or with bolas. When fully grown it measures between four and five feet, from the point of the beak to the end of the tail, and from the tip of one wing to that of the other it measures twelve to fourteen feet. In one province a curious method of capturing the condor alive is practiced.



A FULL FLEDGED SOUTH AMERICAN CONDOR.

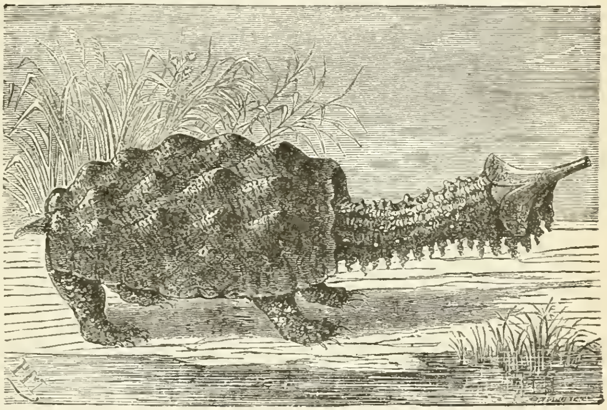
A fresh cow-hide, with some fragments of flesh adhering to it, is spread out on one of the level heights, and an Indian, provided with ropes, creeps beneath it, while some others station themselves in ambush near the spot, ready to assist him. Presently a condor, attracted by the smell of the flesh, darts down upon the cow-hide, and then the Indian, who is concealed under it, seizes the bird by the legs, and binds them fast in the skin as in a bag. The captured condor flaps its wings and tries to fly, but is soon secured, and carried in triumph to the nearest village. Living condors are often sold in the markets of Chili and Peru, where a very fine one may be bought for a dollar and a half, or about six shillings.

To the astonishment of all the birds and animals, a railway runs across the pampas now. They, no doubt, wonder who the bold, flying intruder can be who dares to rush screaming across their domain just when he pleases; forgetting, if they do thus wonder, that they themselves are unlike the very first occupants of their home. Ages ago the sea tossed its silvery spray where the pampas now are, and under the surface have been found carcases of great sloths and armadillos, and other skeletons of old animals that have been buried in its soil, which must have fallen into the river as it flowed through the forests. Though like their present descendants in form, the creatures were in those days much larger, the most famous of them all, perhaps, being the Megatherium Cuvieri, an immense sloth, from twelve to eighteen feet long, and with bones larger than those of an elephant. If trees grew in those days the sloth was so huge that it certainly could not have climbed them, as the present sloths do now, back downward. Instead of attempting that performance, it is thought that it used actually to uproot the whole tree, in order to get the foliage that it wanted for food. A great many other immense skeletons of animals have been found. So many there are that it is almost impossible to dig deeply in any part of the pampas without finding some such remains, which tell of tribes long since extinct and buried.

A STRANGE CREATURE WITH SHIELD AND HELMET.

From the interesting narrative of a South American traveler we append this account of a singular monster, which is one of the wonders of the animal kingdom: Paddling on till nearly dark, we landed on an island, where it was proposed we should pass the night. There were but few trees in the centre, the rest consisting of sand and rock. This spot had been selected to avoid the risk of being surprised by unfriendly natives or prowling jaguars. The canoes were hauled up, the goods landed, and fires were lighted, round which we were soon seated taking our evening meal. The Indians then cut a number of stout poles, which they drove into the ground, forming a square, the roof being thatched over with palm-leaves, extending some distance beyond the poles, so as to form deep caves. To these poles were hung up our hammocks. This was our usual style of encampment. When the trees grew sufficiently wide apart, we sometimes secured our hammocks to them, with a roof such as I have mentioned above our heads. The fires were kept up all night, and a watch set to prevent surprise, should any unfriendly natives find us out, and come across the river in their canoes.

Before retiring for the night, taking my companion, I went out for a stroll, and while the Indians remained in the canoe, we landed and walked along the sandy shore of the island. The dog ran before us, shoving his nose into the tall reeds and rushes. Suddenly out he backed, barking furiously, but still retreating, and evidently less disposed than usual for battle. Fully expecting to see a huge anaconda come forth, we retired to a safe distance, while I got my gun ready to fire at the serpent when he should appear. We stood watching the spot which the dog still faced, when the reeds were moved aside, and the oddest-looking monster I ever set eyes on came slowly forth, and for a moment looked about him. The dog actually turned tail, and fell back on us for support. He would have faced a lion, but the creature before him had not a vulnerable part on which he could lay hold. It meantime, regardless of him or us, made its way towards the water. It was as grotesque and unlike what we fancy a reality as those creatures which the wild imaginations of the painters of bygone days delighted in producing. How can I describe it? It was covered all over with armor—back, neck, and head. On its head it wore a curiously-shaped helmet, with a long tube in front serving as a snout, while its feet were webbed, and armed with sharp claws at the end of its thick and powerful legs. From the chin hung two fringe-like membranes, and the throat and neck were similarly ornamented. Our guide was not far off, and came paddling up at a great rate, crying out to us to turn the creature from the water. Its formidable appearance and size made us somewhat unwilling to get within reach of its head; for it was fully three feet long, and its covering would, it appeared, turn off a bullet. We impeded its progress; but still it made way, and was just


THE WONDERFUL MATAMATA.

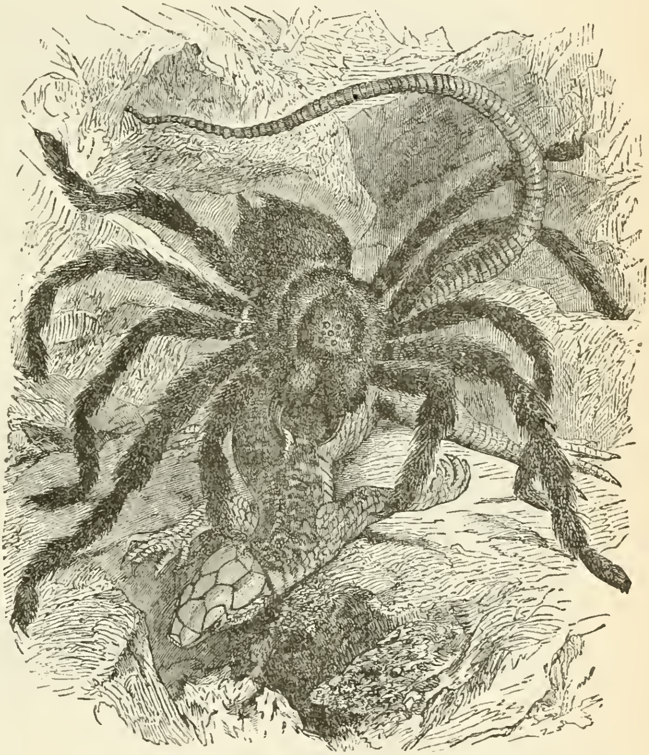
about to launch itself into the river when the canoe coming up, the guide's harpoon struck it under the shield at the neck. It struggled to get free, but was hauled again upon the sand, and soon dispatched by the Indians. They seemed highly pleased at the capture, and signified that, in spite of its strange appearance, it was excellent for food.

The strange creature we had met was a matamata. It is found plentifully in Demerara, where its flesh is much esteemed. What we took to be a helmet, consisted of two membranous prolongations of the skin, which projected out on either side from its broad and flattened head. The back was covered with a shield, with three distinct ridges or keels along it, and was broader before than behind. It had a stumpy pointed tail. I should add that it feeds only in the water, concealing itself among reeds by the bank, when it darts forward its long neck and seizes with its sharp beak any passing fish, reptile, or water-fowl—for it likes a variety of food—or it will swim after them at a great rate. We carried the matamata to the camp, and on landing it drew it up with sipos, with its neck stretched out. One could scarcely believe that it was a real creature, so strange was its appearance and withal so formidable.

AN UNEQUAL COMBAT.

Our traveler goes on to relate another adventure, showing the habits of some of the smaller, yet voracious species of animals, or reptiles, that infest South America: Daylight was increasing. We should soon, we hoped, be able to see our way through the forest, and ascertain our position. We all remained silent for some time, the dog lying down by my side, and placing his head upon my arm. While thus half between sleeping and waking, I heard a rustling sound, and opening my eyes, half expecting to see a snake wriggling through the grass, they fell on a beautiful little lizard making its way down to the water. At that moment a pile of dry leaves, near which it was passing, was violently agitated, and from beneath them sprung a hairy monster, with long legs and a huge pair of forceps, and seized the lizard by the back of its neck, holding it at the same time with its front feet, while the others were firmly planted in the ground to stop its progress. In vain the lizard struggled to free itself. The monster spider held it fast, digging its forceps deeper and deeper into its neck. I was inclined to go to the rescue of the little saurian, but curiosity prevented me, as I wished to see the result of the attack, while I knew that it had already, in all probability, received its death wound. The struggles of the lizard grew feebler and feebler. Its long tail, which it had kept whisking about, sank to the ground, and the spider began its meal off the yet quivering flesh, enjoying it apparently to the fullest extent.

On examining it I found that it was a great crab-spider, which are said to eat young birds and other small vertebrates, though they generally, like other spiders, live upon insects. This spider will attack humming-birds, and, indeed, other small specimens of the feathered tribe. When unable to procure its usual food of ants, it lies concealed under leaves as this one had done, and darts out on any passing prey which it believes it can manage; or if not, it climbs trees and seizes the smaller birds when at roost, or takes the younger ones out of their nests. It does not spin a web, but either burrows in the ground, or seeks a cavity in a rock, or in any hollow suited to its taste.

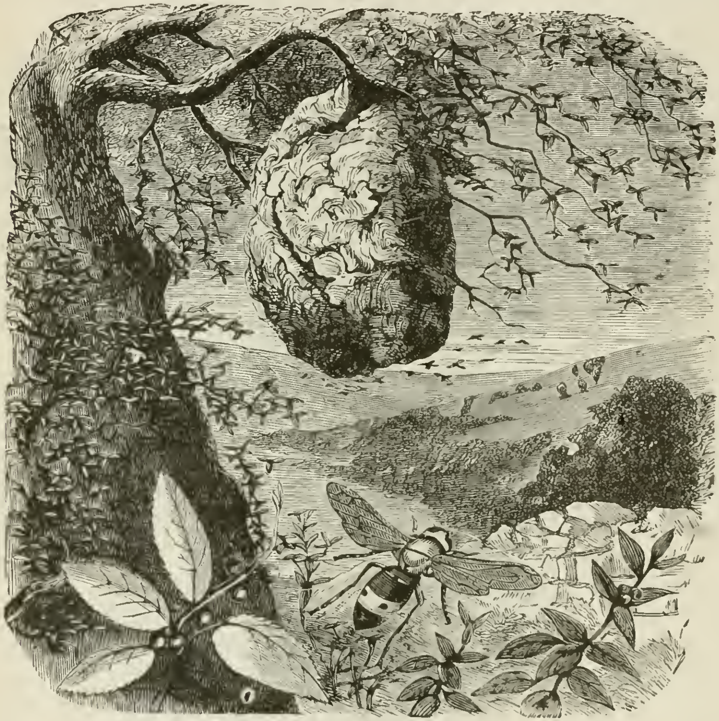


A SPIDER CRAB SEIZING A LIZARD.

I had never seen any creature of the spider tribe so monstrous or formidable. Under other circumstances I should have liked to have carried the creature with us to show to my companions. As soon as my companion had killed it, a native jumped up and cut off the two forceps, which were as hard and strong as those of a crab; and I have since seen such set in metal and used as toothpicks, under the belief that they contain some hidden virtue for curing the toothache. Whether the creature possesses any poison in its system I do not know, but the dog seemed disinclined to have anything to say to it, although he did not object to make a breakfast off the lizard it had killed.

South America is a rare place for venomous insect life. One pest that any traveler would wish to escape is the wasp. The wasp is not generally looked upon with much favor; indeed, he rarely gets any quarter. It is certainly a severe trial to the temper, when you pull a plum, to find that this insect has already taken possession of the fruit, and to have your attention somewhat forcibly drawn to the circumstance by a fierce sting on your finger. The natural and pardonable impulse is to visit the aggressor, and all his kith and kin, with the most condign punishment. Two of a trade never agree—the wasp and the human being are both fruit eaters, and fall out in consequence.

Yet, notwithstanding our natural hostility to the hornet, there are many circumstances with reference to himself and his history that form most interesting subjects for study, and many naturalists have devoted a great deal of attention to the matter. The sting which we fear with such good reason, is a very beautiful apparatus. It is a very minute tube, at the end of which, in the body of the wasp, is a small bag, in which a store of the poisonous fluid is kept. When the hornet is irritated, he darts the little tubular sting into the offender, the small bag is compressed and a drop of poison is inserted, producing a sharp pain.



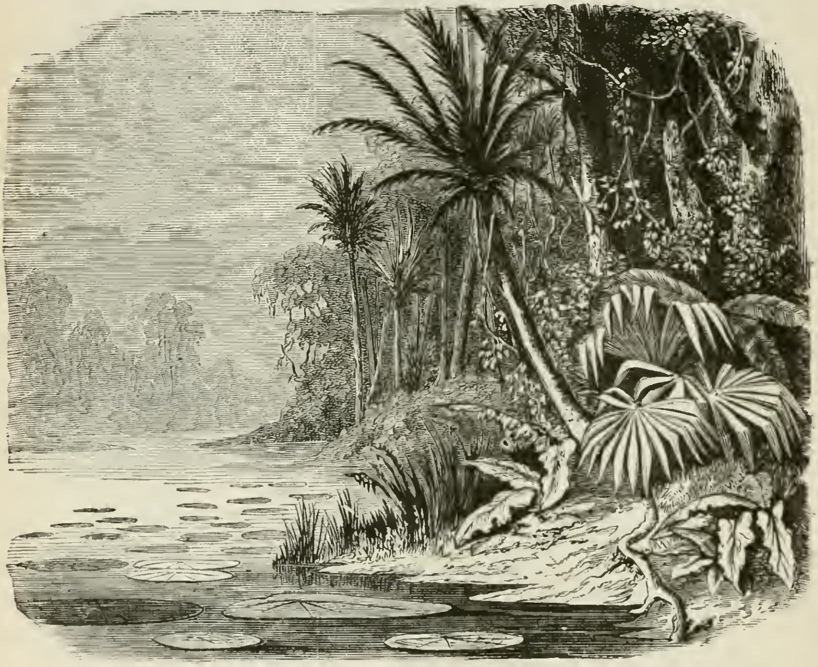
THE LIVELY HORNET.

The nests which are suspended from the branches of trees are much finer and closer in texture than those buried under the ground, which are the most frequently met with; but the method of construction is much the same in both cases. The history of the formation of one of these nests is as follows:—A female wasp which has survived the winter that has proved fatal to the males, seeks in spring for a suitable spot. She selects a hole in a bank, or in a thatch, or sometimes a bush, as the scene of her labors. Here she commences to make her nest. Her materials are paper, and this paper is made of wood. The wasp has been seen sitting on a window-sill tearing off shreds of wood, collecting them into a bundle, and flying away with them. She has been further traced in the process of comminuting them, adding to them a glutinous secretion, making a mixture which, spread out in layers, forms the paper. With these layers of paper she commences the globular nest. It is coated all round with many layers of the paper, and contains inside a number of combs, somewhat resembling those of a bee-hive, except that they are vertical, while the combs in a wasp's nest are horizontal.

After the female has completed a certain portion of the nest and constructed a number of cells, she deposits an egg in each. These eggs are shortly hatched. She then supplies the young with food. This consists of various sweet morsels, portions of fruit, honey stolen from the bees, and particles collected in visits to sugar casks. As soon as the young have reached maturity, on them devolves the entire duty of finishing the home, and of nurturing the grubs. There is but one queen wasp in each nest, the others being either males or workers, and she alone lays eggs, so that all the population of the vespiary are her offspring. The young wasps which are to form future queens—to be the parents of other nests in the succeeding seasons—are fed differently when young from the ordinary workers: they have an allowance of animal food consisting of insects which have been captured, or of fragments of meat purloined from the butcher's stall or elsewhere. The males are larger than the workers, but are not so large as the queens. Their duty appears to be to discharge certain menial offices connected with the internal economy of the nest.

In this part of the world are to be seen some immense water-lilies. So large are they that we could almost imagine they belonged to an ancient family of very large plants that ornamented the world in those ages long ago when the Megatherium and the Mylodon and similar huge creatures lived and stalked about among our forests and by the sides of our rivers. The place where the finest of the lilies grow is on the beautiful Lake Muna, the water of which, instead of being pure and clear, as we should think the home of such lovely flowers ought to be, is as black as ink. A traveler thus describes a beautiful scene: The surface of the lake was thick with huge dark-green leaves, each of which had all round its edge a border of a wine-colored rosy-tint. Among these great leaves expanded magnificent flowers, whose petals outside were milky white, while inside they were rose-colored, the very centre of the flower being a rich violet tint. The surface of the lake looked like an immense flowery carpet, upon which were walking hundreds of wading birds, who trotted along perfectly at ease, knowing all of them that the ground beneath them was quite strong enough to bear the weight of their bodies, even though some of them were by no means small specimens of the bird family.

The next thing to be done was to gather one of the lilies; in order to do this the boat was pushed into the huge net-work of leaves and flowers, and there, with the aid of a strong stick, a splendid lily, and also a bud were broken away from the rough, strong, prickly stalk. More difficult still was it to obtain one of the huge leaves, for they were held down by knotty stalks as thick as a ship's cable; but after a good deal of hard work a leaf also was broken off. Its weight was actually thirteen pounds and a half; the flower weighed three pounds and a half, and the bud weighed two pounds and a quarter. A kind of carriage for the leaf was made by fastening together a number of sticks which two black servants carried, the large flower and bud being carried by a third native.



A BEAUTIFUL FOREST SCENE WITH REMARKABLE WATER LILIES.

The extreme southern point of South America is Patagonia. The Patagonians have long been famous for their great height; though some travelers tell us that many of our countrymen are quite as tall. In the year 1520 a great explorer, named Magellan, landed on the coast of their country, and he was very much amused at the sight of these huge creatures. They were much bigger than the Spaniards he had left behind, and because they wore shoes made of the skin of the animal called guanaco, his men gave them the name of Patagones, which word means large feet.

They paint their bodies, not only for the sake of ornament, but with the idea of protecting their skin from the cold, and rain, and sun. Those of them who prefer real clothing, make mantles out of guanaco fur, and boots from either the skin of a horse or that of a puma. These garments are made by the women, who are very clever workwomen, for the needles they use are nothing but pieces of bone sharpened to a point, and the thread is made from the sinews of the guanaco. Like most savages, both the men and women are very fond of ornaments, such as large, square ear-rings, and necklaces of all descriptions. A comical appearance they present. When seated on their horses they trot off to the hunt with their painted bodies decked out in feathers and jewelry. Their houses, or toldos, as they are called, are simply tents made by planting stakes of wood in the ground, and then covering them with the skins of animals.

The guanacos, which are to be seen in great numbers all over Patagonia, are very quick runners. The head of this animal is like that of a camel; his body is like a deer's, only it is covered with a yellowish kind of wool, and he neighs like a horse. It is in the skin of one of these animals, made into what is called a capa by the Indian women, that the Patagonian ostrich hunters are arrayed, when, mounted on their horses, they fly across the pampas after the swift-footed birds. These capas, made from the skins of the young guanacos, are extremely warm, and serve well to protect the wearers of them from the cold winds that blow over the pampas.

The plan adopted for catching these animals is rather curious, and one which makes a fine day's sport for the hunters. Around a large, open space of ground a number of posts are fixed in the form of a large circle; a piece of string is then carried from one post to another, and in the spaces large sheets of paper or linen are hung. The hunters—who may be men, women, or even children—scatter themselves in all directions, and try to chase as many guanacos as possible from the mountains around towards the inclosure which has been made. A large opening is of course made where the animals can enter; and the hunters make so much noise, shouting, screaming and throwing their sticks and weapons about, that the frightened creatures before long are assembled in the inclosure. There they scamper about, and would like to rush out again, because of course they could easily leap the lines of cord, but the flying sheets waving about in the breeze so terrify them that they do not dare to approach them, and thus are very soon put to death by their pursuers.

The weapon chiefly used by these wild hunters is called the bolas, which in their hands answers all the purposes of firearms or bows and arrows. It is made by covering two round stones or pieces of lead with leather, and then joining them together with thongs, which, very frequently, are the sinews from the legs of the ostrich. The Indians swing the bolas quickly round their heads, and then throw them at the animal they are chasing. Nearly always the balls get twisted round whatever part of the body they fall on, so that the animal cannot run, and thus the hunter gains possession of it.

One very strange custom among these people is that of gathering together all a dead man's possessions and burning them ; consequently there is no such thing in Patagonia as a child inheriting the father's property, because, however rich a man may be in horses, dogs, bolas, clothes, or anything else, all are gathered together in a heap at his death and burned. After this performance—which of course appears to us useless and extravagant—the body of the man is wrapped in a coat of mail, if he should have happened to own one, if not, in guanaco skins; and in the skin with him are placed his hunting and warlike weapons, and also any objects of value that he very much cared for when living; and these, with the body, are fastened securely upon the dead man's favorite horse.

In order to make the procession still more mournful, the horse has to endure the pain of having one of its hind legs broken, after which it has to go limping on under its load until it reaches the last resting-place of its master. All the women friends of the Indian widow join in the procession, and mingle their shrieks and cries of agony with hers, and the men of the party paint their bodies black. On reaching the grave —which is usually chosen on the summit of a high hill—the body is laid in it, after which the lame horse is thrown in also, and very often with it a number of other animals, which will be needed, so the Patagonians think, as food by the dead man in the unknown world to which he has traveled.

CHAPTER XI.

A WONDERFUL COUNTRY.

Wonders of the Great West—Niagara Falls—Buffalo Hunting—"Dog Town" —Wonders of Vegetation—The Marvelous Yellowstone Region—Geysers and Falls—Masterpieces of Sublime Scenery—The Celebrated Cañons—The Romantic Colorado—The Mountain Cross—Utah and the Great Salt Lake—The Mormons—Polygamy—Strange Extinct Animal Life—Rivers of Ice—Yosemite—Awful Abysses—Towering Falls—Nature's Prodigal Magnificence—The Traveler's Astonishment—Immense Trees—Untold Mineral Resources—Indians—A Crow Chief—Indian Characteristics—Red Man as a Farmer—Indian Wars and Ambushes—Indians not Dying Out—Life in the Forest—Wigwams and their Inmates.

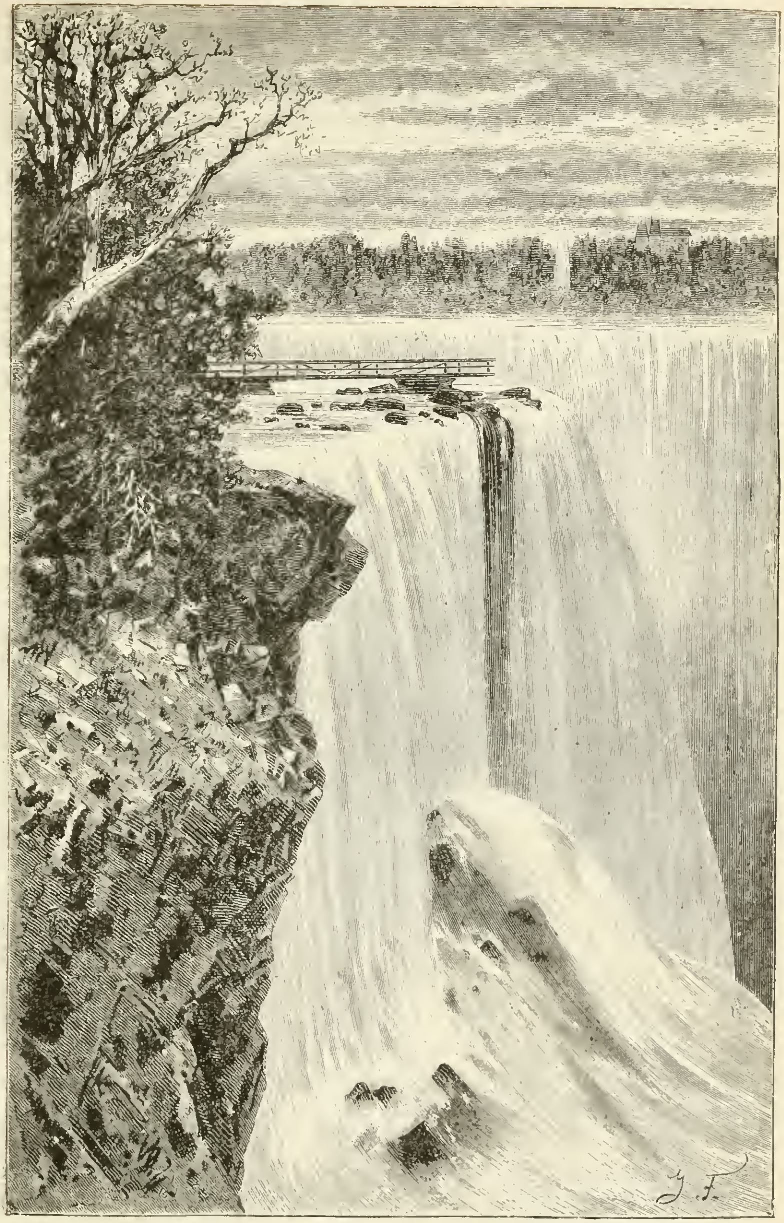
THE countries already described abound in marvelous objects, but in many respects our own land surpasses all others, and leads the world in its unrivaled wonders. Especially is this true of the vast region lying beyond the Mississippi, yet before coming to that, we find in the vicinity of the Great Lakes natural phenomena which have awakened the astonishment of every beholder.

The great natural wonder of this locality is the Falls of Niagara, discovered by Père Hennepin in the year 1678. The Niagara River, forming the boundary line between Canada and the States, flows almost north for a distance of thirty-six miles of which twenty-two are above and fourteen are below the Falls. Above the Falls the river encircles a large island, known as Grand Island, its course thus far being quiet. Presently, however, it begins to feel the influence of the coming leap, and sweeps along more impetuously, and soon breaks into furious rapids. Reaching the head of Goat Island, it separates into two branches ; that on the American side rushing straight forward to the brink in a mass a thousand feet broad, and shooting over into the gulf below. That on the Canadian side of Goat Island sweeps around, and plunges over a cliff in the form of a horseshoe (hence the name of this Fall), the two parts of the river mingling at the foot of the Fall. The height of the American Fall is one hundred and eighty feet. That of the Horseshoe Fall is slighty less, owing to the smaller height of the crest. Its leap is one hundred and seventy-three feet.

As the current approaches Goat Island it seems to flow with redoubled velocity. It is impossible to conceive anything equal to the force and swiftness of its progress to the ledge of rocks over which it is propelled, till it impetuously tumbles into the bed of the river beneath, with a noise louder than thunder. When the waters fall into the deep basin, they rebound into the air in immense spherical figures, white as snow and sparkling as diamonds. These figures, after rising and apparently remaining stationary for a moment, explode at the top and emit columns of spray to an astonishing height. They then subside and are succeeded by others which disappear in the same manner. From that part of the Table Rock which yet remains, the spectator commands one of the grandest and most romantic views in nature. The tremendous rapids above the Falls—Goat Island in their midst, covered with trees, which seem at every moment about to be swept away; the Horseshoe Fall, immediately below Table Rock; Fort Schlosser Fall, beyond Goat Island; and the frightful gulf beneath, boiling with perpetual rage and shooting upwards immense volumes of sparkling foam, smoking with apparent intensity of heat;—are a few of the great objects which are forced upon his attention.

Another place from which the Falls assume, if possible, a more striking and awful appearance, is at the bottom of the cataract. The precipice leading to this spot is descended by means of a ladder, the perpendicular height of which is upwards of sixty feet; you proceed along the edge of the river, which is covered with broken rocks, wrecks of boats, and other rubbish, until you arrive at the bottom of the Horseshoe Fall. From this place visitors frequently proceed on foot several hundred yards, within a prodigious sheet of caverned water, which is formed by the overshooting of the cataract. But they must be men of the firmest nerve who venture on such a daring enterprise, for the most undaunted resolution is in danger of being shaken on looking upward at the impending rock, which continually seems to bend and groan beneath the rolling flood, to which it serves as a fearful support. From the projecting edge of this rock the mass of waters is impelled forward, and leaves a large and smooth expanse, which reaches from the sheet of falling water to the very base of the gradually undermined mountain. If the atmosphere be dense it is still more dangerous to engage in the bold attempt of exploring the stable foundations of the river, for people at such times not infrequently lose the power of respiration in proceeding far beneath the rocky ceiling. Notwithstanding this and various other dangers to which all are equally exposed who venture to approach the Fall in boats, the fisherman frequently continues there for hours together, apparently without any apprehension of danger.

The crumbling edge of the precipice, for it does crumble, proves that Niagara, like all waterfalls, tends to work backwards.



THE WORLD-RENOWNED NIAGARA FALLS.

There would be no erosion but for the fact that the last seventy-eight feet of its course, a more yielding argillite or clay slate has been washed from beneath the overlying limestone by the mechanical force of the vast volume of water here precipitated. When the Niagara shall have carried its gorge back to the mouth of Lake Erie, great changes will ensue. Every day sees something taken from the rocky barrier; and, geologically speaking, at no remote time our Great Lakes will have shared the fate of those that once existed at the far West. Already they have been reduced to less than half their former area, and the water level has been depressed three hundred feet or more. This process is pretty sure to go on until they are completely emptied. The cities that now stand upon their banks will, ere that time, have grown colossal in size, then gray with age, but in the sediments that are now accumulating in these lake basins will lie many a wreck and skeleton, tree trunk, and floated leaf. Near the city sites and old river mouths these sediments will be full of relics that will illustrate and explain the mingled comedy and tragedy of human life. These relics the geologist of the future will doubtless gather and study and moralize over, as we do the rocky records of the ages past.

ASTONISHING PHENOMENA OF THE GREAT WEST.

The western part of the North American Continent is one great plateau, crested by the numerous ranges which collectively make up the Cordilleras of North America. Occupying nearly the whole breadth of Mexico, from ocean to ocean, it enters the United States, extending, with its long eastward slope, from near the one hundredth meridian westward nearly to the Colorado River. Its flat crest is at the continental water-parting, where it is four to five thousand feet above the sea. As we follow its limits northward, we find its eastern boundary, though indefinite and shading by imperceptible degrees into the prairies of the Mississippi Valley, generally to run nearly north. The western boundary sweeps gradually to the westward to the Sierra Nevada, and follows this great range and the Cascade Mountains of Oregon, Washington Territory, and British Columbia. As its breadth increases, its elevation increases also. The continental water-parting, following its summit, increases in elevation through New Mexico and Colorado, reaching its maximum in the latter State, where, over a great area, the mean elevation of this plateau is from eight to nine thousand feet. Thence northward its elevation decreases gradually, and at the northern boundary of the States its mean elevation is not above four thousand feet. Within this region marvels appear at every step.

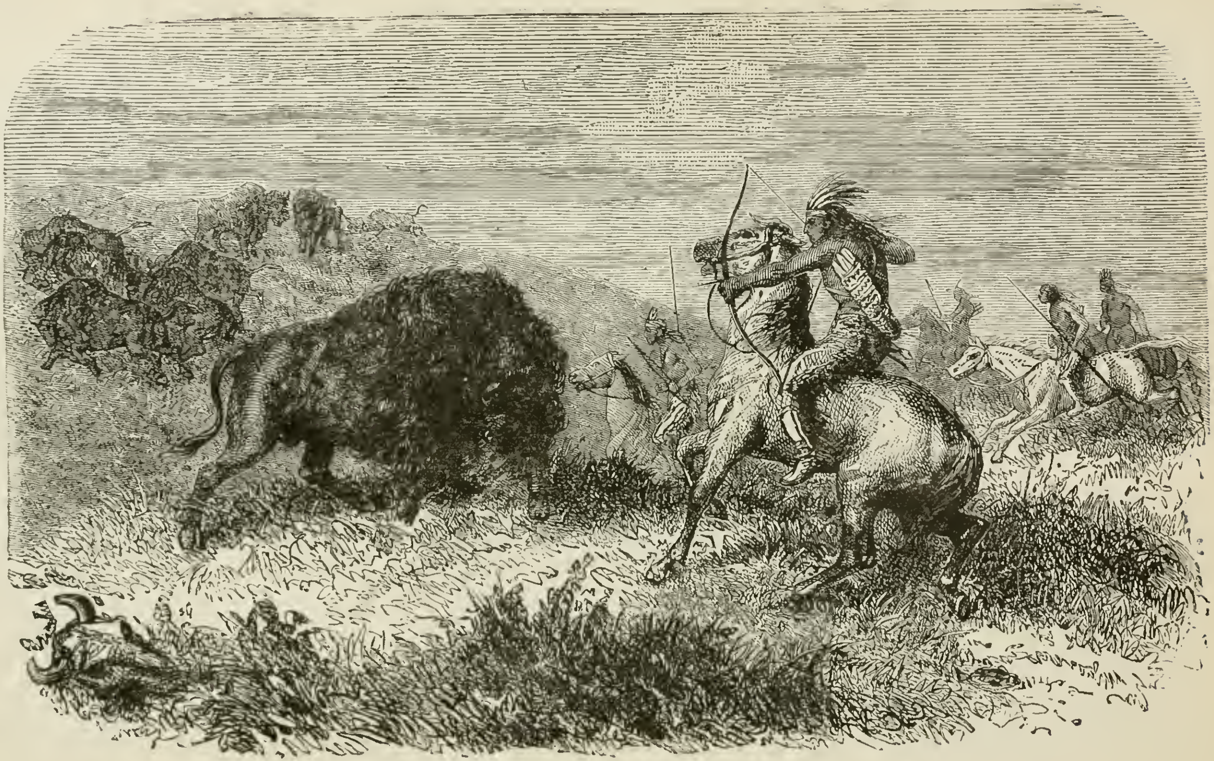
The plains which form the eastern slope of the great Cordilleran plateau have no well-defined eastern limits, but pass imperceptibly into the prairies of the Mississippi Valley. They rise gradually, with a very uniform slope, towards the west. The surface is a monotonous, rolling, treeless expanse. The stream-beds are but slightly below the general level, and the water-partings between the streams are indicated only by broad swells in the surface. The landscape resembles the ocean in its long, billowy undulations. There are no landmarks, and the mariner is no more dependent upon his compass and sextant than is the traveler upon this great expanse when away from the traveled routes.

When we mention the plains, the buffalo is immediately suggested. The buffalo, or more properly the American bison, formerly ranged over the larger part of the continent, being restricted on the eastward only by the Alleghanies, and on the north by the increasing cold of the higher latitudes. Now, its range is practically restricted to the plains, and the roads and railroads intersecting the latter are fast limiting its home to small and unfrequented localities in the far north and south. They have retreated and diminished before advancing civilization.

HUNTING THE WILD BUFFALO.

They are, as is well known, gregarious animals, and formerly ranged over the plains in almost fabulous numbers. At times, herds have been met with of immense size, numbering thousands, and even millions, of individuals. The accounts given by many veracious travelers respecting their size sound almost like exaggerations. Herds were formerly met with extending for many miles in every direction, so that the expression, "so numerous as to blacken the plains as far as the eye can reach," has become a hackneyed description of their abundance. Some writers speak of traveling for days together without ever being out of sight of buffaloes, while it is stated that emigrant trains were formerly sometimes detained for hours by the passage of dense herds across their routes. In the early history of the Kansas Pacific Railway it repeatedly happened that trains were stopped by the same cause. Now all this is changed. Since the railroads penetrated the buffalo country, they have been slaughtered wholesale for their hides only. The destruction has been enormous, and, unless soon checked, the species will become extinct in a few years. Where formerly these immense herds obstructed the way, now only a few scattered individuals are seen. A careful estimate from existing data places the number of these animals killed during the last fifteen years at about two millions annually.

The two modes of hunting the buffalo chiefly practiced at present are the pursuit on horseback and the "still hunt." The first-named is the one usually chosen where sport and excitement are the things mainly desired, the still hunt being practiced when a supply of meat or of hides is the object. The latter method affords but little excitement, and



THE ADVENTURESOME KIOWAY INDIANS HUNTING WILD BUFFALOES.

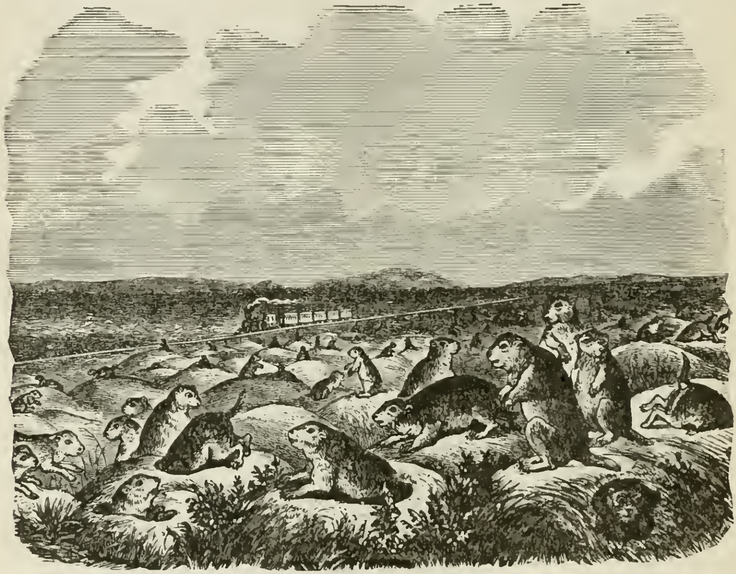
entails, with proper precautions, little or no risk of life or limb on the part of the hunter. Parties hunting for pleasure prefer the chase on horseback, shooting from the saddle with heavy revolvers at close range, when at full gallop. Success depends almost wholly (provided the hunter is a good rider) upon the speed and endurance of his horse, and is really about as noble sport as attacking a herd of domestic cattle would be. The chase on horseback of a drove of Texas cattle would be far more dangerous, and attended probably with as much excitement, except that in the case of the buffalo the hunter has the consciousness of pursuing a nominally wild animal, and hence legitimate game. That the chase on horseback affords the wildest excitement is an undeniable fact. The swift pursuit of the flying mass of buffaloes, the mingling with the terrified herd, the singling out of the victim, the rapid shots at the huge moving bulk of hair and flesh, at so close range that the game is almost within reach of the hand, the tottering fall or headlong tumble of the doomed animal, the risk of pursuit by a wounded bull maddened with pain, the general din and confusion with the double risk of collision with the blind, fleeing monsters, or of being thrown by treacherous marmot or badger holes, can, of course, yield only excitement of the intensest kind, both to the rider and his steed.

The still hunt is far more fatal, and is the method adopted by the professional hunter. The buffalo being naturally unsuspicious and sluggish, even to stupidity, is readily approached within easy range, even in a level country, where the slight herbage of the plains is the only shelter. The chief precaution necessary is to keep to leeward of the herd, in order not to give them the scent. The professional hunter, when desiring to load his teams with meat, will rarely make his first shot at a greater distance than fifty or seventy yards. If the shot result fatally, the herd rarely moves more than fifty yards before stopping to look for the cause of the mishap to their fallen companion. Here others fall before the hunter's shots; the herd, again slightly startled, moves on a few paces, and again stops to gaze. The hunter, still keeping prostrate, approaches if necessary, and continues the work of destruction. The shots are thus often repeated, till fifteen, twenty, or even thirty buffaloes are killed before the herd becomes thoroughly alarmed, and, in hunter's parlance, "stampedes."

VAST CITIES OF BURROWING ANIMALS.

Elk, antelope, and several species of deer, are abundant on the plains from autumn to spring, when they retire into the mountains for the summer. In the frozen regions of the far north the buffalo is replaced by the musk-ox and the antelope by the reindeer.

A curious animal, popularly known as the prairie dog, is very abundant all over the plains. It is a burrowing animal, about the size of a large gray squirrel, living in communities, some of which contain thousands of individuals. Many of their cities cover a number of square miles each. The surface resembles a newly-planted cornfield, being covered with little mounds of earth, each indicating the home of a family. On each mound sits a prairie dog on his haunches, like a kangaroo, and greets the intruder with a chorus of short piping barks. They are shy little fellows, and, on a nearer approach, they make a dive for their holes, and, with a short quick wriggle of their hinder parts, disappear. Living with them in their villages, and tolerated perforce, are rattlesnakes and a small species of owls which make a good diet off the young of their hosts.



THE HOME OF THE PRAIRIE DOG.

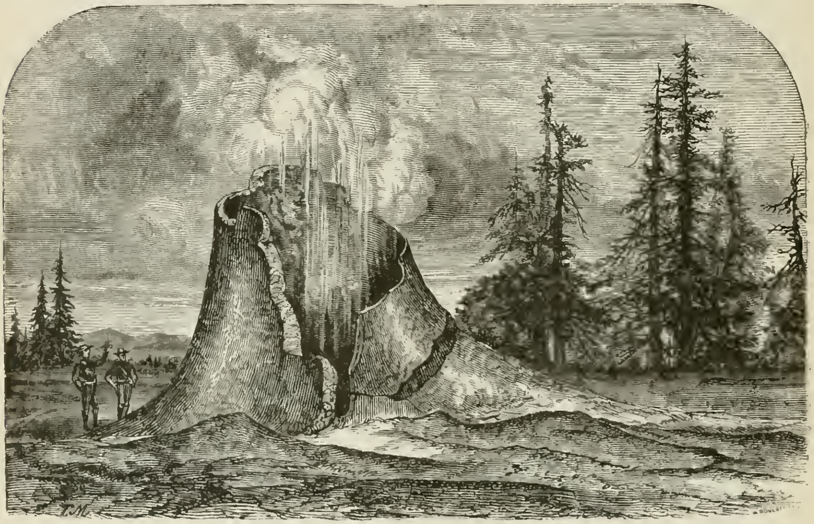
The territory of the great plains was formerly a region of deep seas. In early time it was covered by the ocean that spread continuously over almost the entire region of the United States. Its expanse was interrupted only by a few islands in the region of the Rocky Mountains, and a few embryonic mountain ridges in the Appalachian region. In later time the plains were covered by the great Mediterranean Sea, which extended from the Gulf of Mexico to the Arctic Ocean. Later still, the surface was marked by a series of great fresh-water basins. The fauna and flora of the lake deposits of the plains are of the same age as those on the west side of the Rocky Mountains. During subsequent periods the continental surfaces were broad and covered with a vegetation very much like that of the present day, although the climate was much milder than now. Over the western plains roved great herds of quadrupeds, rivaling in number and variety those that have struck with wonder and surprise the traveler in South Africa.

Then a warm and genial climate prevailed from the Gulf to the Arctic Sea; the Canadian highlands were higher, but the Rocky Mountains lower and less broad. Most of the continent exhibited an undulating surface, rounded hills and broad valleys covered with forests grander than any of the present day, or wide expanses of rich savanna, over which roamed countless herds of animals, many of gigantic size, of which our present meagre fauna retains but a few dwarfed representatives. Noble rivers flowed through plains and valleys, and sea-like lakes, broader and more numerous than those the continent now bears, diversified the scenery. Through unnumbered ages the seasons ran their ceaseless course, the sun rose and set, moons waxed and waned over this fair land; but no human eye was there to mark its beauty, nor human intellect to control and use its exuberant fertility. Flowers opened their many-colored petals on meadow and hillside, and filled the air with their perfumes, but only for the delectation of the wandering bee. Fruits ripened in the sun, but there was no hand there to pluck, nor any speaking tongue to taste. Birds sang in the trees, but for no ears but their own. The surface of lake or river was whitened by no sail, nor furrowed by any prow but the breast of the water-fowl; and the far-reaching shores echoed no sound but the dash of the waves and the lowing of the herds that slaked their thirst in the crystal waters.

THE YELLOWSTONE NATIONAL PARK.

The country about the heads of the Madison, Yellowstone and Snake Rivers, in the north-western part of Wyoming, seems to have been set aside for the exhibition of the action of volcanic forces. In time past, but geologically very recent, this region has been repeatedly covered by floods of lava; great ranges of mountains have been built by catastrophic action; and to-day we find these forces still actively at work, as evidenced by the innumerable hot springs and geysers which are found all over the surface. Before the geysers of the Yellowstone National Park, all others of the world—even the celebrated ones of Iceland—sink into insignificance.

Until a very recent period this country was an unknown region, save from the vague tales of Indians and white hunters and trappers, and these wonders were scarcely suspected. Deterred by the difficulties of approach, many exploring parties have passed by this marvelous locality. It was not until 1864 that any authentic account of any part of the country was obtained. In that year a prospecting party penetrated the western edge of this region, and by accident came to what is now known as the Lower Geyser Basin, near the head-waters of the Madison River. The accounts of this discovery, however, attracted little attention; but in 1870 a party was organized in Montana to test the truth of these stories. This party discovered most of the wonders of the region, and published them to the world. During the two following years the region was thoroughly explored by the parties of the United States Geological Survey of the Territories, and the results were officially published by the Government; and in the winter of 1871–2 the region embracing these wonders was set off by Congress as a national park. Its marvels are the property of the public.



A YELLOWSTONE SPOUTING GEYSER.

This park contains about three thousand five hundred square miles. It is mainly a high rolling country, covered by a dense growth of coniferous timber. Several small groups of mountains diversify its surface, and along its eastern border stretches a high, rugged, volcanic range, separating the waters of the Yellowstone from those of the Big Horn. The average elevation of the Park is about eight thousand feet above sea-level, an elevation which gives it an almost arctic climate. For nearly nine months of the year snow lies on the ground, and frost is liable to occur even in midsummer nights. The month of September usually ushers in the winter, and there is no abatement of its rigors.

Hot springs are found in innumerable localities throughout the Park.

They are omnipresent. Among the dense timber, on the plateaus, in the valleys, on the walls and at the bottoms of cañons, on mountain slopes and even at the summits—yes, even in the beds of lakes and rivers—they are found. With their deposits they have built mountains, as at the White Mountain Springs, or have floored whole valleys, as in the Geyser Basins of the Firehole or Madison River. They are of all sizes, from a few inches in diameter to areas of several acres of hot water—of all temperatures, from tepid to boiling. Associated with these springs, at a dozen or more localities, are active geysers, throwing columns of boiling water, in extreme cases, two hundred feet in height. Altogether there are known to be fifty geysers within the Park.

THE FAMOUS WHITE MOUNTAIN SPRINGS.

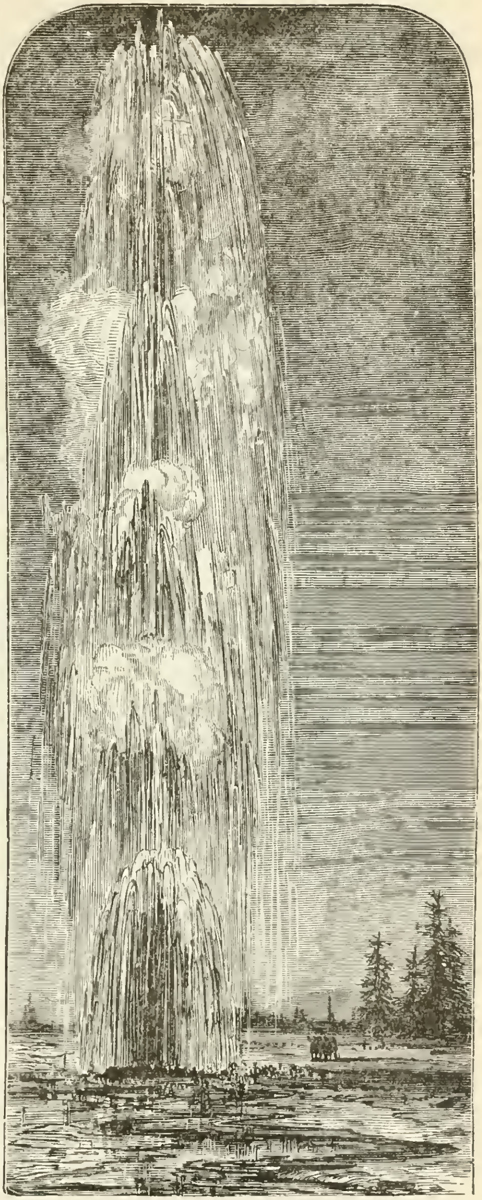
Leaving the settlements at Bozeman, Montana, and following up the Yellowstone River to the Park,—which, by the way, is the usual route to "Wonderland,"—the first group of springs which arrests attention on entering the Park is that of White Mountain or the Mammoth Springs. These springs are highly charged with calcareous matter, which they deposit, on cooling, in marvelous quantity. On approaching them the visitor beholds a hill, two hundred feet in height, of dazzling whiteness, with its sides striped with bands of vivid red and yellow. This hill is the work of the springs, which burst forth upon its summit and pour their waters down from basin to basin upon its sides. The steep sides of the hill are ornamented with a series of semi-circular basins, with margins varying in height from a few inches to six or eight feet, and so beautifully scalloped and adorned with a kind of bead-work, that the beholder stands amazed at this marvel of Nature's handiwork. Add to this a snow-white ground, with every variety of shade of scarlet, green and yellow, as brilliant as the brightest of our aniline dyes. The pools or basins are of all sizes, from a few inches to six or eight feet in diameter, and from two inches to two feet in depth. As the water flows from the spring over the hill-side from one basin to another, it loses continually a portion of its heat, and the bather can find any temperature he desires. At the top of the hill there is a broad flat terrace, covered with these basins, one hundred and fifty to two hundred yards in diameter. Here are the active springs. The largest one is near the edge of the summit. It is twenty-five by forty feet, and the water is so perfectly transparent that one can look down into the blue ultramarine depth to the bottom. The transparency rivals that of the far-famed waters of Lake Geneva.

Near the head of the Madison River, which here is known as the Firehole, are two small valleys, one containing a dozen, the other about twenty square miles, in which is the greatest collection of hot springs and geysers in the region. Of these the upper contains the greatest number and the most active geysers. Imagine a valley shut in by high bluff walls, its bottom floored throughout with a hard white glistening crust of silica, the deposit from the almost innumerable hot springs and geysers which dot its surface. Through the middle of the valley flows a small river, whose water is constantly warm. In this valley there are no less than eighteen true geysers, most of which throw water to a considerable height. Some of them are irregular in their periods; others doubly periodic, having two or more eruptions at short intervals, and then taking a long rest. Some of the more wonderful are worthy of a brief description.

The mouth of the geyser called "Old Faithful" slopes inward, and measures on the outside eight feet by four. Its crater is a mound of geyserite, which rises twelve feet above the surrounding level. The eruptions of this geyser commence with a few abortive attempts, followed by a rapid succession of jets, which soon reach a maximum, and then gradually decrease, followed by a short discharge of steam. The average length of an eruption is about five minutes, and the period of inactivity one hour and three minutes. The maximum measured height of the column of water is one hundred and thirty feet. This is one of the finest and most regular of all.

The geyser known as the "Bee-hive" is recognizable at once by its cone, which has the form of an old-fashioned bee-hive, three feet in height and about seven in diameter at the base. It is coated with beautifully-beaded formations, which have an almost pearly lustre. The eruptions are very fine, and are peculiar to this geyser. The water and steam issue from the orifice in a steady stream instead of successive impulses. The greatest measured height of the column of water is one hundred and seventy-eight feet, while the steam has been forced one hundred and ninety-three feet into the air. During the eruptions the pent-up steam shakes the earth around with mighty throbs. The period of this geyser is irregular, as is also the duration of its eruptions.

In approaching the crater of the "Architectural" geyser, the observer is not at first impressed with its importance, as the outer rim of the basin, or rather table, in the centre of which the fissure is situated, is raised but two or three feet above the general level. The surface is diversified by an infinite number of forms and colors. The depressed parts in some places are so level and white and hard, that a name could be engraven as easily and as well as upon the bark of a beech-tree. In others, there are most exquisitely-modeled basins and pockets, with ornamented rims, and filled with perfectly transparent water, through which thousands of pebbles can be seen lying on the velvety bottoms.



THE GIANTESS GEYSER.

The "Giantess" has a huge basin, twenty-three and a half by thirty-two and a half feet across. It is rather a great pool, which, were it not for its rarely-occurring eruptions, would be mistaken for a quiet hot-spring pool, of which there are many in the basin. When in eruption it throws a great mass of water to a small height, surging and splashing in all directions. The greatest height of the water, which was measured, was thirty-nine feet, while the steam was forced up sixty-nine feet. This geyser seems to be doubly periodic, having a succession of three eruptions at intervals of about an hour, and then a rest for a long period, whose duration has not been ascertained.

The "Grand Geyser" has no raised cone, only a basin sunk below the general level, like that of a quiet spring. It is fifty-two feet in diameter. In its centre is the geyser tube, which measures four feet by two. The greatest measured height of an eruption was one hundred and seventy-three feet. Its periods seem to be irregular. The eruption consists of three distinct periods of action, after each of which the water sinks completely out of sight, and water overflows from the Turban Geyser, which is in immediate proximity, into the basin of the Grand. The mass of water carried up is enormous; while through this main mass a smaller column shoots at intervals to a much greater height. The scene thus presented is not only singular, but is as difficult to explain as it is beautiful.

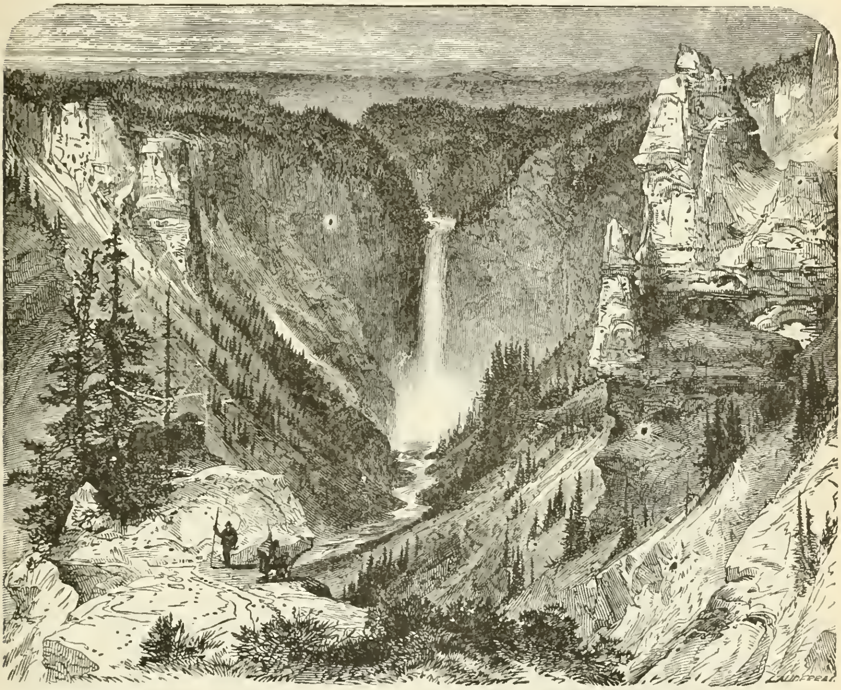
Of one of the hot springs in the Lower Yellowstone basin a traveler writes: On the upper side of the spring, next to the bank, the water—in overflowing—ran into large, shallow pools, painting whatever it touched with the colors of the rainbow. Beds of rich creamy white and rich yellows were interlaid with patches of siennas and purples, and divided up and surrounded by the most fantastic patterns of delicate grays and rich browns. On the side next the creek the running water has made a network of streams. In those where the water is still hot, the colors are bright, varying from a creamy white to the brightest yellows; but as the water becomes cooler further down, the colors grow darker and richer, the siennas greatly predominating; while the basins of the larger pools are stained with still darker colors, frequently of a purple tint, and reflecting the picturesque groups of pines on their dark surfaces. Thus we have every variety of color and imagery.

THE GRAND CAÑON AND FALLS OF THE YELLOWSTONE.

Hot springs and geysers are not the only objects of interest in this region, for Dame Nature, ever lavish of her treasures, has richly endowed this country. Its mountains, waterfalls, and cañons, are well worthy of a momentary glance. The Yellowstone River, from the lake at its head to its point of exit from the Park, presents the traveler with an ever-changing panorama of scenes. Leaving the lake, for several miles the river is broad, flowing with a gentle current between high, wooded banks. Soon, however, rapids intervene, the river-bed becomes narrow and broken up by huge rocks; the river roars tumultuously along, down a steep, broken incline, and shoots over a precipice one hundred and twelve feet in height. This is the Upper Fall. Recovering itself after this ebullition, the great river moves quietly along its course for a half-mile, and then suddenly rolls over a sheer precipice three hundred feet in height, into the depths of the Grand Cañon, down whose sinuous course it roars and tears along, an emerald-green band, flecked with snowy foam, between the deeply colored walls of the cañon.

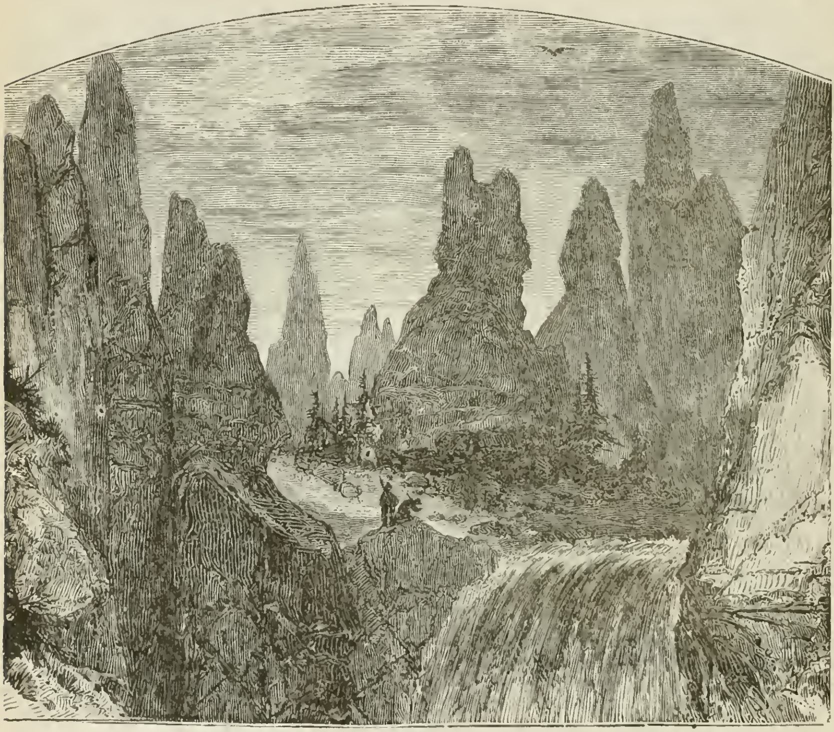
A MASTERPIECE OF SUBLIMITY.

The river suddenly narrows to a width of only one hundred feet, and rushes over a ledge, falling three hundred feet to the bottom of the cañon. The water at the edge of the fall is very deep, and of a deep green color. When we approach the brink and look over into the abyss, we begin to realize the littleness of man in the presence of Nature's grand masterpieces. Down, down goes the whirling mass, battling and writhing as the water dashes against the rocks with a noise like the discharge of artillery. Here and there a resisting rock is met with, and the water rebounds, broken into myriads of drops, which throw back to us the sunlight resolved into its primitive colors. The bottom of the cañon reached, the immense mass of water seems to dissolve itself into spray, and then recovering, it flows down the gorge an emerald-green stream, dashed with patches of white, beating with furious waves the rocky walls that imprison it. Taken in connection with the varied tints of the cañon itself—red, yellow, orange, white—the dark green pines fringing the top, and the bright green of the spray-nourished moss on the sides of the fall, we have a picture of almost unequaled magnificence and grandeur. It is a scene of which one never tires, and in the description of which language fails.



THE GRAND CAÑON AND LOWER FALLS OF THE YELLOWSTONE.

The Grand Cañon is a gorge some twenty miles in length, cut in a volcanic plateau. It has a depth of twelve hundred to fifteen hundred feet, and a width at the top in few places exceeding a half-mile. The walls are precipices or inclined at a fearful angle. The river flows in the sharp notch at the bottom. Access to the bottom of the cañon is to be found only at a very few places, and in those the climb is not unattended with danger. On the east side of the river a narrow crevice in the friable volcanic rock affords a way down to the foot of the fall, where, if the visitor desires a thorough shower-bath at Nature's hands, he can obtain it. Hot sulphur-springs are found in the greatest abundance at the foot and on the slopes of the cañon-walls, adding the colors of their deposits to those of the brilliant volcanic rocks. Half-way between the two falls a small stream, known as Cascade Creek, enters the river. Just before reaching the main stream, this creek makes a beautiful cascade, about one hundred feet in height, over the basaltic pillars which border the river, dashing and foaming to the bottom far beneath.



THE WONDERFUL ROCK PINNACLES, YELLOWSTONE RIVER.

Passing around the cañon of the Yellowstone by a circuitous trail, crossing a high pass, nearly at timber line, in the Washburn Mountains, the visitor reaches the river again at the mouth of Tower Creek, a large western branch. This, like most of the tributaries to the Yellowstone in this neighborhood, flows at a much higher level than the river, and reaches its level by a fall. The fall on this stream is, in itself and its surroundings, particularly fine. Tearing along in a rapid course, it is suddenly contracted between two tall columns of volcanic formations whence it leaps over a precipice in an unbroken fall of one hundred and thirty-two feet, into a deep, dark, gloomy gorge, where the sunlight never penetrates. The walls of this gorge are set with columns of rock, which project above the top in tall needle-like spires.

This is a land of streams and waterfalls. On each of the three forks of Gardiner's River, on Gibbon's River, and the main Madison, and on Lewes' Fork of the Snake, are falls well worthy of the attention of the lover of nature in her wildest moods. It is, also, a land of lakes. From the summit of Mount Sheridan, the topmost peak of the Red Mountains, one overlooks a country diversified by mountains, hills and dales, and rolling plateaus, all densely covered with the dark black-green of coniferæ. In this magnificent setting he sees on every hand the deep blue-green of crystal lakes and lakelets. North of him Yellowstone Lake stretches its broad expanse, its long arms extending far inland, and holding mountainous promontories in its grasp; Shoshone and Lewis' Lakes to the north-west, reflecting the rays of the afternoon sun; Heart Lake, a most beautiful gem, is at his feet; and, scattered about amid the primeval forests, are innumerable little lakelets.

Nor are these all the beauties or wonders of the Park. The mineralogist finds here unsurpassable treasures. Nearly all the varieties of quartz are found in profusion, and silicified wood encumbers the ground. In many localities forests have been overflowed by streams of liquid rock, or overwhelmed by showers of volcanic ashes; and the forests thus covered have been gradually changed, particle by particle, into silicified wood, crystalline quartz, amethyst, and other like products. Nature, by erosion, has exhumed these vegetable Herculaneums, and we find great trunks and branches of trees scattered over the surface, or standing in place, or projecting in bas-relief from the faces of cliffs, but all changed to stone, as though at the sight of a Medusa's snaky locks. These petrified forms are of the most marvelous description.

At present the Park is not easily accessible to the average traveler. The usual route from the east is *via* the Union Pacific and the Utah Northern Railroads, thence reaching Bozeman, Montana, by a long tedious stage-ride of three days and nights. This point is the last settlement, with the exception of a few ranches, and the traveler must henceforward be self-dependent. He must buy or hire saddle animals to carry himself and party, and pack-animals to transport provisions, tents, mess-kit, and other impedimenta. He must carry his provisions and rely upon his rifle for a supply of meat. Traveling in the Park is not unattended by difficulties. Heavy, well-beaten trails lead to many localities of interest, but when one leaves them he is like a mariner upon an unknown sea. Not only is the country rugged and somewhat mountainous, but it is so densely timbered that one may travel for days without being able to correct his "dead reckoning" by the sight of a single landmark. If the sun disappear, the traveler becomes dependent upon his compass. Moreover, very large areas of country are covered not only with a living growth of trees, but apparently all the timber that has lived and died there since the flood has been heaped up, like huge jackstraws, to oppose his progress. Immense extents of country are so blocked with this fallen timber as to be totally impassable. Again, there are on the plateaus and in the valleys great areas of swamp which are almost equally impassable.

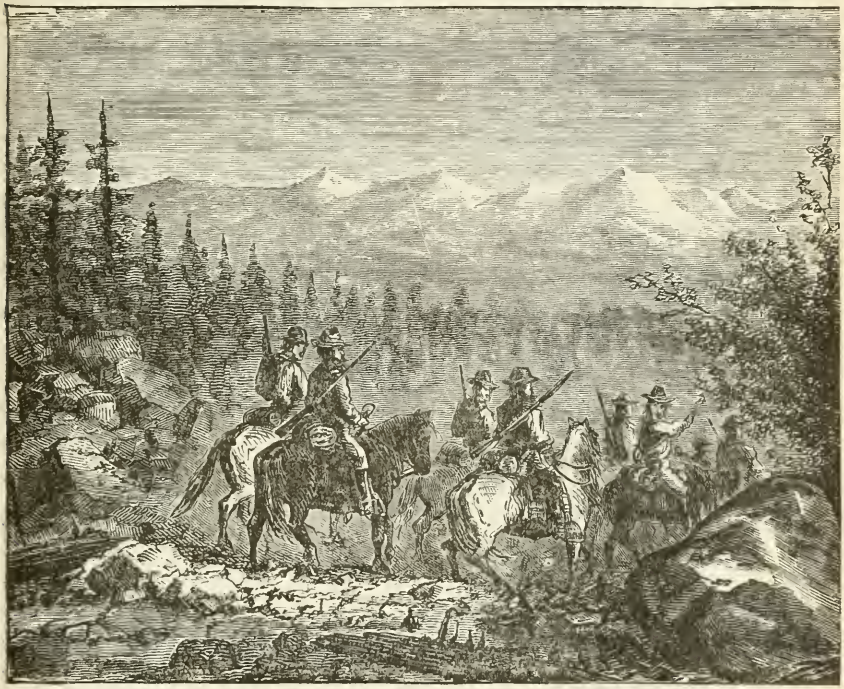
THE GREAT FALLS OF THE MISSOURI.

Near Fort Benton the river apparently tires of the monotony of its course, and, after a few preliminary rapids, it enters the series of falls and cataracts which are known as the "Great Falls." There are five principal cascades: the first, of twenty-five feet fall, abuts three miles below the mouth of Sun River; the second nearly three miles below this, of five feet eleven inches; and immediately below it the third. Here, between high banks, a ledge, nearly as straight as if formed by art, runs obliquely across the river, and over it the waters fall forty-two feet in one continuous sheet of four hundred and seventy yards in width. Half a mile below this is the fourth, a small irregular cascade of about twelve feet descent. The stream then hurries on, lashed and churned by numerous rapids, about five miles further, when it precipitates itself over a precipice seventy-six feet high. The banks are high and abrupt on both sides, with deep ravines extending into the prairie for one or two miles both above and below it. Below the falls there is a succession of rapids, which become less and less frequent, to the mouth of Highwood Creek, gradually disappearing as we proceed.

INACCESSIBLE MOUNTAIN PEAKS.

Turning now southward again, we find on the east of the Upper Yellowstone a high ragged range, extending from the bend of the Yellowstone southward to South Pass. Its northern portion is known as the Yellowstone; its southern the Wind River Range. The latter separates the head-waters of Green River, a fork of the Colorado, from those of the Big Horn. It is one of the most rugged ranges on the continent, its crest being a line of spires, pinnacles, needles, and overhanging cliffs. Its peaks range from thirteen thousand to nearly fourteen thousand feet in height, and many of them are totally inaccessible except to creatures with wings. There is but one pass in the range, which can be crossed by animals, and only during the four summer months, as during the rest of the year it is choked with snow.

In the year 1847, Captain J. C. Fremont, in command of an exploring expedition, succeeded, after three days of severe climbing, in scaling one of the highest peaks of this chain, a mountain thirteen thousand five hundred and seventy feet in height. This peak has since borne his name. Since that time the range has been practically untouched by the many exploring expeditions which have traversed the West, until the "Survey of the Territories," under Dr. Hayden, entered this field in 1877. During that and the following year the range has been surveyed in detail by this organization. Its fastnesses have been traversed; its innermost secrets of structure unfolded. Among other new phenomena made known to the world, the existence of living glaciers in the rocky gorges was clearly ascertained. This remarkable fact respecting these mountains of the United States was demonstrated. Several small glaciers, both in this range, and in the Tétan Range further westward, were discovered. They are the ruins of glaciers on a magnificent scale which, in very late geologic times, this range sent down from the snow-capped peaks far out into the Green River Basin. To-day we see their remains in the form of great lateral and terminal moraines, running far up the mountain slopes and skirting each cañon, to a height of three thousand feet above the plain. The streams pursue devious and tumultuous courses through, over, and among the boulders of their terminal



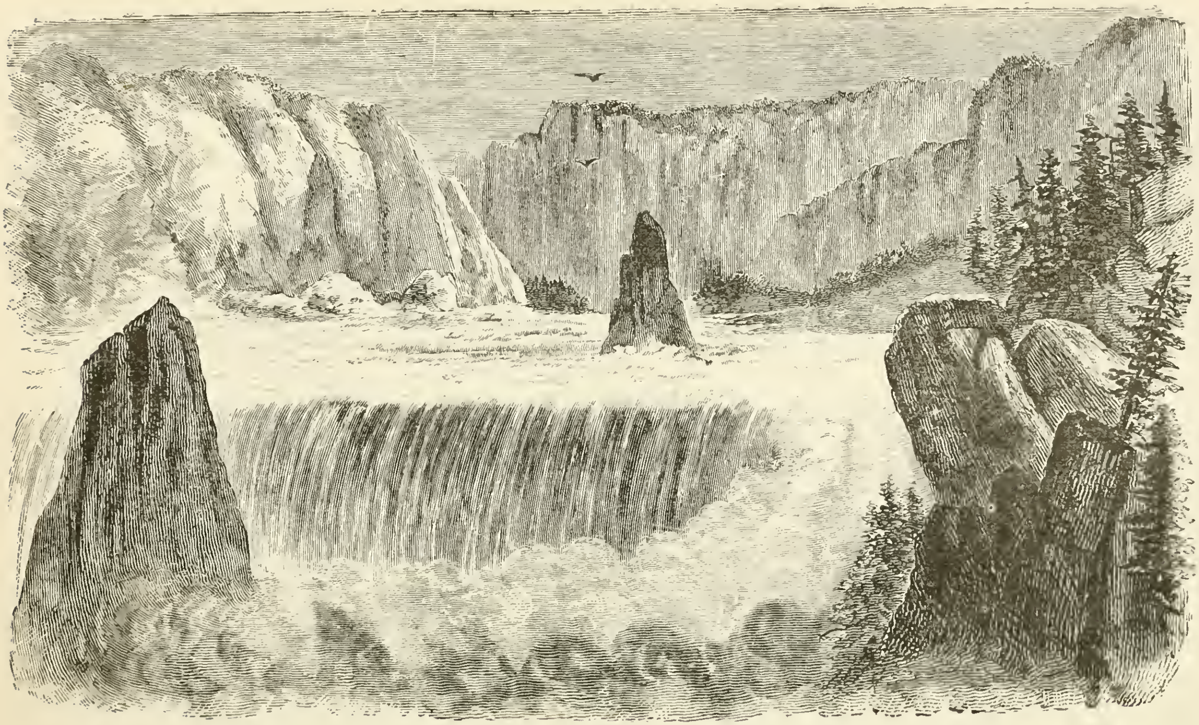
FREMONT AND HIS EXPEDITION IN SEARCH OF THE WONDERFUL.

moraines, and all along the base of the mountains are beautiful crystal lakelets, whose beds were scooped out by the ceaseless grinding of the great ice-power.

The Snake, or Lewis Fork of the Columbia, heads in the Yellowstone National Park, opposite the heads of the Madison and Yellowstone Rivers. Its sources are in beautiful lakes, embosomed in heavily wooded hills. Flowing southward it soon enters a mountainous country, from which it receives several large tributaries. It washes the east base of the Tétan Range, which rears its rugged Gothic spires seven thousand feet above its valley. Turning to the west, the river cuts across the mountains which seek to check its course, in a terrific gorge, well nigh impassable. On the west side of these mountains it enters upon a great field of basalt, a great volcanic plain, covered with drifting sand and seamed with crevasses like those of a glacier. This is known as the Snake River Plains. In its course across and around the basalt plain it is rapid and tumultuous, boiling and seething along, its bed broken by boulders and ledges. In several places there are noteworthy falls. The upper of these is the American Fall, at a point a few miles below the mouth of the Portneuf, where the "Mad" River, as it was called in early days, leaps over a wall of basalt thirty feet in height, thus accounting for the singular name given to it.

THE GRAND NIAGARA OF THE WEST.

Some distance further down is the Shoshone Fall, by far the greatest and finest on the river. A visitor gives us this fine description of it: The wall of the gorge opposite us, like the cliff at our feet, sank in perpendicular bluffs nearly to the level of the river. A horizon as level as the sea; a circling wall, whose sharp edges were here and there battlemented in huge fortress-like masses; a broad river, smooth and unruffled, flowing quietly into the middle of the scene, and then plunging into a labyrinth of rocks, tumbling over a precipice two hundred feet high, and flowing westward in a still deep current to disappear behind a black promontory. Dead barrenness is the whole sentiment of the scene. In plan the fall recurves up-stream in a deep horseshoe, resembling the outline of Niagara. The total breadth is about seven hundred feet, and the greatest height of a single fall about one hundred and ninety. The whole mass of the fall is one ever-varying sheet of spray. In the early spring, when swollen by the rapidly melted snows, the river pours over with something of the volume of Niagara. There are no rocks at the base of the fall. The sheet of foam plunges almost vertically into a dark, beryl-green, lake-like expanse of the river. Immense volumes of foam roll up from the cataract-base, and, whirling about in the eddying winds, rise often one



THE MARVELOUS SHOSHONE FALLS AND THEIR ROCKY ENVIRONS.

thousand feet into the air. The incessant roar, reinforced by a thousand echoes, fills the cañon.

The surrounding desert plains extend from the southern extremity of the Bitter Root and Salmon River Ranges southward to the Snake, and from Eastern Idaho nearly to its western boundary. Their surface is slightly undulating, broken only by crevices, and covered by drifting sand, or, in its absence, by bare rock and boulders. The sage tree is almost its sole vegetable product, and here this bush attains arborescent proportions, growing to a height of twelve to fifteen feet, with trunks nearly a foot in diameter. The desert has little water upon its surface. The streams from the mountains soon disappear in crevices, to reappear and disappear perhaps again, meantime flowing beneath the basalt floor in subterranean channels. Near the middle of this desert are three mountains, standing alone and detached from one another, the "Three Buttes." Strange objects are these mountains, rising nearly three thousand feet above the plain. Of their structure we know nothing, as they have never been studied by the geologist. From time immemorial they have served as landmarks to the traveler on these pathless wastes like lighthouses to the mariner, placed there apparently for this purpose. The country drained by the Colorado River is a peculiar region. It is a country of plateaus and cañons, the plateaus mainly arid and sterile where the few streams flow in deep gorges far below the surface.

THE WONDERFUL CAÑONS OF THE GREAT WEST.

Great cliffs, thousands of feet in height, and extending like huge walls for hundreds of miles, change the level of the country at a single step. Isolated buttes and mesas of great height are scattered over the plateaus, indicating the former height of the plain of which they formed parts. The landscape everywhere, away from the river, is of rock—cliffs of rock, tables of rock, plateaus of rock, terraces of rock, crags of rock—ten thousand strangely carved forms. Rocks everywhere and no vegetation; no soil; no land. When speaking of these rocks, we must not conceive of piles of boulders, or heaps of fragments, but a whole land of naked rock, with giant forms carved on it; cathedral-shaped buttes, towering hundreds or thousands of feet; cliffs that cannot be scaled, and cañon walls that shrink the river into insignificance, with vast, hollow domes and tall pinnacles, and shafts set on the verge overhead, and all highly colored—buff, gray, red, brown and chocolate; never lichened, never moss-covered, but bare and often polished.

Nearly every watercourse, whether perennial or not, is a cañon; a narrow valley, with precipitous walls, often of enormous height. In many cases these cañons are so numerous that they cut the plateau into shreds—a mere skeleton of a country. The extent and magnitude of the system of cañons in that direction is astounding. The plateau is cut into shreds by these gigantic chasms, and resembles a vast ruin. Belts of country, miles in width, have been swept away, leaving only isolated mountains standing in the gap; fissures so profound that the eye cannot penetrate their depths are separated by walls whose thickness one can almost span; and slender spires, that seem tottering on their base, shoot up a thousand feet from vaults below. But few of these cañons contain water throughout the year. Most of them are dry at all times excepting for a few days in the early spring, or for a few minutes or hours at most after a heavy shower. It is a characteristic of western North America, as of all arid countries, that the streams, away from their sources in the mountains, lose water, rather than gain it, in traversing the lower country. The dry atmosphere and the thirsty soil absorb it, and, in very many cases, large streams entirely disappear in this way. This is the case to a great extent in the plateau country, and still more so in the Great Basin, where these are the only outlets to the drainage. The demand is more than equal to the supply.

HOW THE STRANGE CHASMS ARE PRODUCED.

A few words will suffice to sketch the manner in which the climate has acted in producing these strange and unique effects. The great degree of aridity of the atmosphere, and the slight rainfall, coupled with its sudden explosive character, render plant-life very limited in amount. The soil, having little or no protection against the sudden floods, is washed away as fast, or nearly as fast, as it is formed; or, in other words, transportation nearly or quite keeps pace with disintegration. The rains, coming as they always do in floods, run immediately off the bare rock, or over and through the thin sandy soil, sweeping it with them, and, collecting in the little runs with incredible rapidity, rush down them in great body and with great velocity, sweeping everything before them. The waters are turbid and thick with sediment, coarse and sharp-edged from the rapid cutting of the rocks. It is this detritus which Dame Nature uses as her chisel in carving cañons, cliffs, buttes, and the other quaint and curious forms which one meets in this strange land. A clear stream, whatever may be its velocity, has little erosive power; but put these tools in its possession, give it the quantity of coarse sand and gravel which the Colorado and its tributaries always hold in suspension, and its cutting power is enormous. The difference in climatic conditions between the district under discussion and the plains is one of degree only, but it is sufficient to produce very marked differences in the surface. Wherever the climatic conditions are such that soil can be formed and be covered with vegetation, there cañons cannot be produced, other than as gaps for the passage of streams through mountain ranges; but, in proportion as the climate becomes more arid, so will the country approach, in its physical features, a cañon land, and be ripped and torn by deep fissures.

While every stream in this region flows in a cañon—and there are thousands of cañons which contain no water whatever—the most remarkable succession of these clefts is that on the main stream of the region, the Colorado, and its main branch the Green. Here, for a thousand miles, the river is almost entirely below the surface, and is deep in the bowels of the earth, rolling and tumbling along underground.

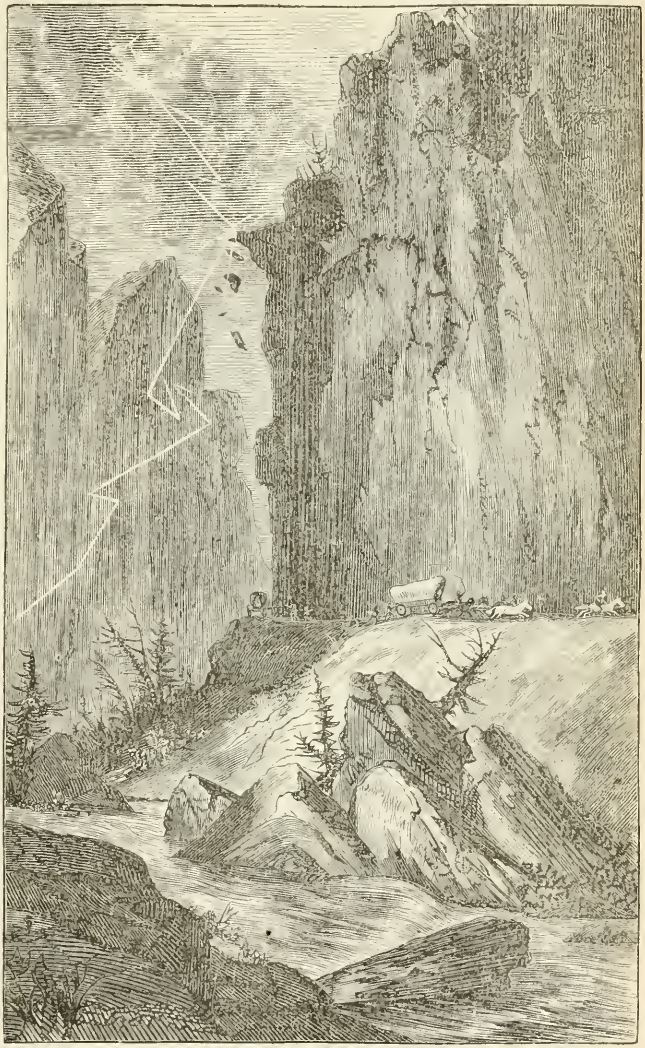
THE GREAT CAÑONS OF THE COLORADO AND GREEN.

The Green River, on leaving the Wind River Mountains, traverses southward a great plain or valley, known as the Green River Basin, at present a waste, but capable of being reclaimed, in large part, by irrigation. At the foot of this valley it meets the Uintah range, trending at right angles to it. This range it traverses by a devious course, cutting gorges of enormous depth. On emerging from these cañons, it enters another valley, quite similar to that above, but smaller, and known as the Uintah Basin. Traversing this, it gradually enters a cañon in sedimentary rocks. These beds, and the surface of the country with them, inclines at a very low angle to the north, so that the stream in its southern progress is constantly getting deeper below the surface, until the walls have risen to a height of more than three thousand feet above the river. At this point the walls break off abruptly, in a direction transverse to that of the river, leaving a small valley at the foot of the cliff.

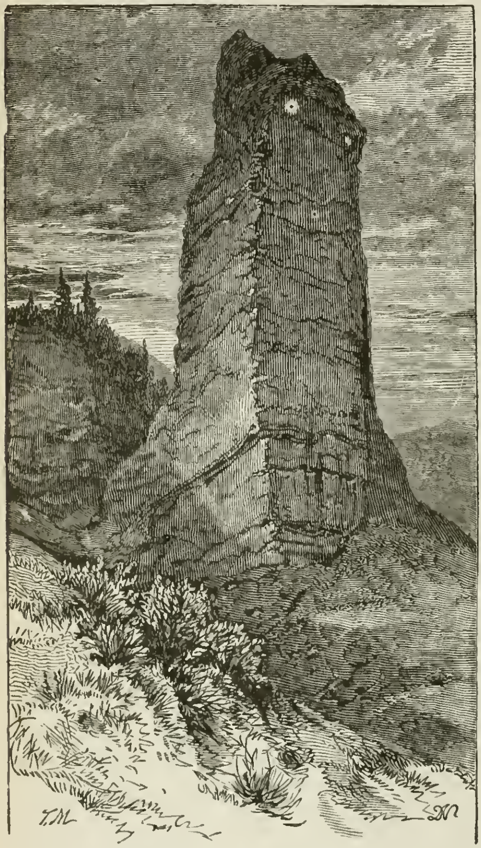
Lower down there follow two similar cañons, but less in height and length. These inclined plateaus, sloping to the north and breaking off abruptly on the south, extend east and west to the bases of the ranges which border this region, that is, across the plateau country. Conceive of three geographic terraces, many hundred feet high, and many miles in width, forming a great stairway, from "the land of standing rocks" below, to the Uintah Valley above.

Further on, the river runs again into cañons, as if afraid of the sunlight. There is here another inclined plateau, sloping toward the north, and in it the river burrows deeper and deeper, until, at the mouth of the Colorado Chiquito, it is three thousand, eight hundred feet below the surface. This is Marble Cañon. The river has turned, and at the foot of this cañon or—for this is continuous with the Grand Cañon—at the foot of this portion, the general course of the river is west. At this point it is crossed by the Paria fold, in which the throw is to the west, thus suddenly increasing the depth of the cañon by adding to the elevation of the country. Further down the river is met another elevation running across the river's course. The cañon here attains its maximum depth, which is nearly seven thousand feet. This is not in a single slope from the water; a part of it is in one or two benches, which stand back one, two, or three miles from the edge of the lower cliffs. The throw of the Paria fold has brought to the surface the underlying granite, and the lower cliffs of the Grand Cañon are of this rock.

The walls now are more than a mile in height, a vertical distance difficult to appreciate. A thousand feet of this is up through granite crags, then steep slopes and perpendicular cliffs rise, one above another, to the summit. The gorge is black and narrow below, red and gray and flaring above, with crags and angular projections on the walls, which, cut in many places by side cañons, seem to be a vast wilderness of rocks. Down in these grand gloomy depths we glide, ever listening, for the mad waters keep up their roar; ever watching, ever peering ahead, for the narrow

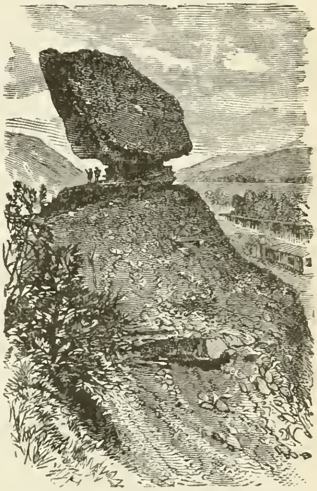

A REMARKABLE SCENE IN THE GREAT CAÑON.

cañon is winding, and the river is closed in, so that we can see but a few hundred yards, and what there may be below we know not; but we listen for falls, and watch for rocks, or stop now and then, in the bay of a recess, to admire the gigantic scenery. And ever as we go there is some new pinnacle or tower, some crag or peak, some distant view of the upper plateau, some strange-shaped rock, or some deep narrow side cañon. Then we come to another broken fall, which appears more difficult than the one we ran this morning.

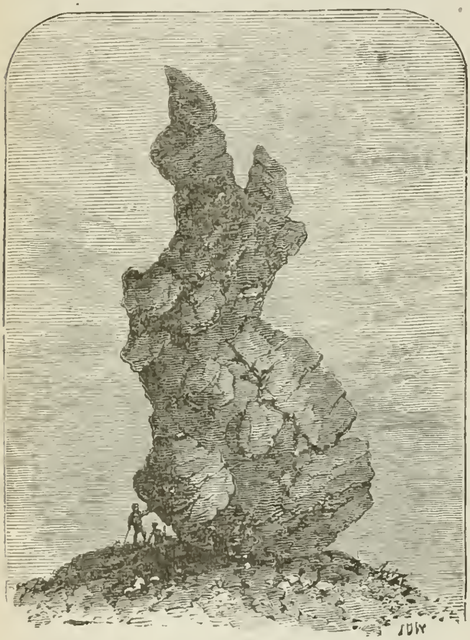

THE MONUMENT ROCK—GRAND CAÑON.

Clouds are playing in the huge chasms. Sometimes they roll down in great masses, filling the gorge with gloom; sometimes they hang above, from wall to wall, and cover the cañon with a roof of impending storm; and we can peer long distances up and down this cañon corridor, with its cloud-roof overhead, its walls of black granite, and its river bright with the sheen of broken waters. Then a gust of wind sweeps down a side gulch, and, making a rift in the clouds, reveals the blue heavens, and a stream of sunlight pours in. Then the clouds drift away into distance, and hang around crags and peaks, and pinnacles and towers and walls, and cover them with a mantle that lifts from time to time and sets them all in sharp relief. Then baby clouds creep out of side cañons, glide around points, and creep back again into more distant gorges. Then, clouds set in strata cross the cañon, with intervening vista-views to cliffs and rocks beyond. The clouds are children of the heavens, and when they play among the rocks they lift them to the region above.

The dangers of the navigation in rivers, like the Colorado, winding through a series of cañons, are naturally often of a very formidable character. A member of the Government Surveying Expedition, who ran many risks in his exploration of these regions, had on one occasion to navigate a rapid in the Grand Cañon at the imminent peril of his life. About eleven o'clock, he writes, we hear a great roar ahead, and approach it very cautiously. The sound grows louder and louder as we run, and at last we find ourselves above a long, broken fall, with ledges and pinnacles of rock obstructing the river. There is a steep descent and the rushing waters break into great waves on the rocks, and lash themselves into a mad, white foam. We can land just above, but there is no foothold on either side by which we can make a portage. It is nearly one thousand feet to the top of the granite, so it will be impossible to carry our boats around, though we can climb to the summit up a side gulch, and, passing along a mile or two, can descend to the river. This we find on examination, but such a portage would be impracticable for us, and we must run the rapid or abandon the river. There is no hesitation. We step into our boats, push off, and away we go; first on smooth but swift water, then we strike a glassy wave and ride to its top, down again into the trough, up again on a higher wave, and down and up on waves higher and still higher, until we strike one just as it curls back, and a breaker rolls over our little boat. Still on we speed; shooting past projecting rocks, till the little boat is caught in a whirlpool, and spun round several times. At last we pull out again into the stream, and now the other boats have passed us. The open compartment of the "Emma Dean" is filled with water, and every breaker rolls over us. Hurled back from a rock—now on this side, now on that—we are carried into an eddy, in which we struggle for a few minutes, and are then out again, the breakers still rolling over us. Our boat is unmanageable, but she cannot sink, and we drift down another hundred yards through breakers—how, we scarcely know. We find the other boats have turned into an eddy at the foot of the fall, and are waiting to catch us as we come, for the men have seen that our boat is swamped. They push out as we come near, and pull us in against the wall. We bail our boat, and on we go again.

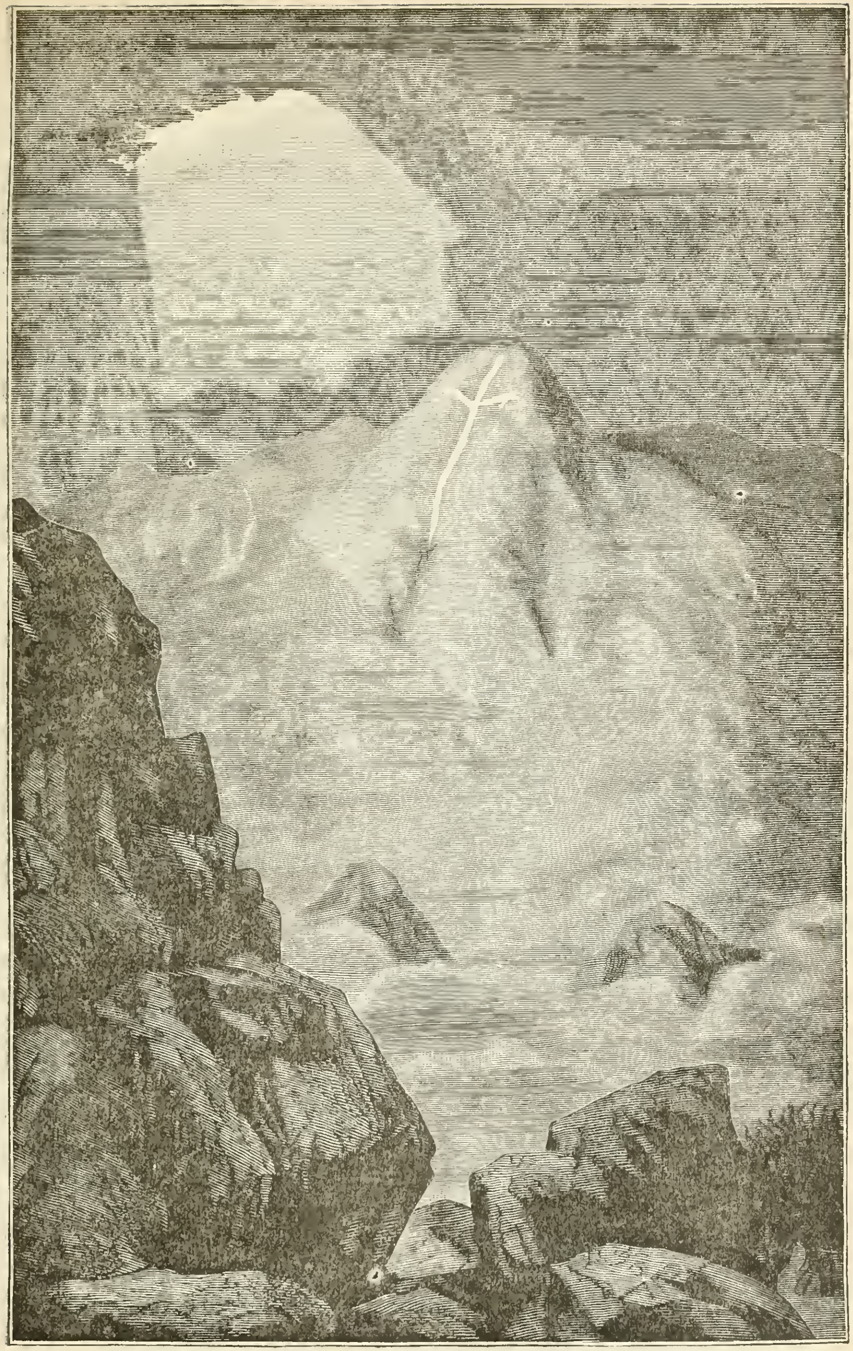

PULPIT ROCK, ECHO CAÑON.

This region is not all a desert. The high plateaus must be excepted from the general formation, but as these are in the immediate vicinity of the mountains, and are of very limited extent, they can scarcely be considered as belonging to the plateau region. On these the fauna and flora of the mountain region are found in abundance, dependent in large measure upon the elevation. As we go down into the true cañon country, the scene changes. Aspens give place to piñon pine and cedar; the grasses, fruits and flowers, to sage, cactus and bare rock; the streams become confined in rocky cañons, turn muddy and warm, and gradually disappear. The game changes—deer and elk are replaced by the coyote, while rattlesnakes and centipedes assert their proprietorship. Among the buttes on the lower terraces, rattlesnakes crawl, lizards glide over the rocks, tarantulas stagger about, and red ants build their playhouse mountains. Sometimes rabbits are seen, and wolves prowl in their quest; but the desert has no bird of sweet song and no beast of noble mien.


SINGULAR PEAK OF CONGLOMERATE.

What is known as the Mountain Cross is one of the most remarkable objects in this region of wonders. The cliffs are very rugged, and are as barren of vegetation as if they were icebergs. One bold peak rises above its inferior neighbors, shooting aloft toward the sky. By some strange action of forces it has been marked at the very summit with the exact figure of a cross. There stands the rugged peak, cold and silent, often wreathed in its far grandeur with drifting clouds and mist, and through the rifts made by the winds that sweep these stately peaks may be seen the striking figure which has given a name to the mountain, and made it the wonder of every beholder.

We come now to the singular depression which characterizes Utah. Let us for a moment take a bird's-eye view of the great inland basin of which Salt Lake Valley forms only a part. We shall find that what is termed the Great Basin of the West comprises the vast area inclosed



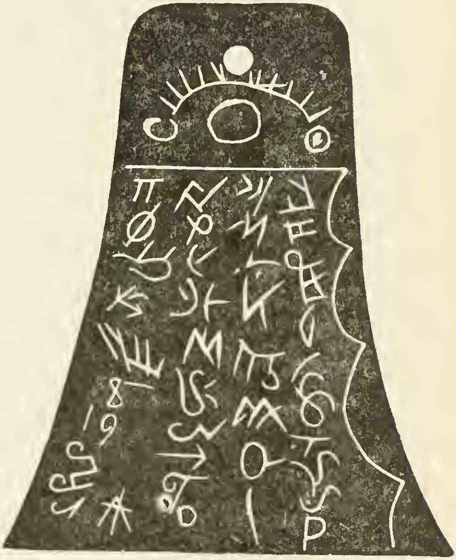
NATURE'S WONDER—THE HOLY CROSS IN COLORADO.

by the Wahsatch Mountains on the east and the Sierra Nevada on the west; the crest or water-divide of the Columbia on the north, and that of the Colorado on the south. We shall also observe that this great region has no visible outlet; that it is composed of a multitude of smaller basins or valleys, each of which has its little lakes, springs and watercourses, their surplus water either evaporating or sinking beneath the surface. If we examine the elevations in this region, we observe a wonderful uniformity in the surface of the valleys, and find that none of them are much above the level of the waters of Great Salt Lake. It is probable that a fresh-water lake once occupied all this immense basin; that the smaller ranges of mountains were scattered over it as isolated islands, their summits projecting above the surface; that the waters have gradually and slowly passed away by evaporation, and the terraces are left to reveal certain oscillations of level and the steps of progress towards the present order of things; and that the briny waters have concentrated in those lake-basins which have no outlet.

The Great Basin is a collection of smaller basins; each, in cases where it has any drainage whatever, with its own stream or streams; its sink, which, in cases where sufficient water is brought in, develops into lakes, marshy swamps, and the like. Those lakes which have no outlet are salt; those which communicate with others lower down are, of course, fresh. The lakes of the Basin are mainly disposed in three groups: one on the east and west sides of the Basin respectively, under the shadow of the limiting ranges, and one in the northern part. The principal member of the eastern group is the Great Salt Lake, which receives most of the drainage from the Wahsatch Mountains. It is almost an inland sea, having an area at present of two thousand three hundred and sixty square miles. It is very shallow, having a mean depth of but four or five fathoms.

There are within the Great Basin two valleys which are remarkable as lying below the level of the sea. One of these, in Eastern California, is known as Death Valley, from the number of persons who have miserably perished there from thirst. Parts of this valley are far below the sea-level. It is a desert valley, lying between two of the characteristic ranges of the Basin, known as the Amargoza and the Panamint Ranges, which rise a quarter of a mile above its level. There is no water in the whole extent of this valley—nothing but bare rock and shifting sand, if we except a few cacti and a little stunted sage. In the summer, the sun's rays, pouring down on the bare rocks, make the heat intolerably intense, and increase the pangs of thirst to the unfortunate traveler. Few persons have succeeded in crossing this terrible place, though many have attempted it.

The sect of recent origin which has awakened the greatest curiosity and criticism is unquestionably the Mormons, or "Latter-Day Saints," settled on the shores of the Great Salt Lake in Utah, where they have converted the wilderness into a smiling garden, and set up a State within the State. Fanatical enthusiasm, theocratic combined with democratic institutions, polygamy not merely permitted but openly preached, gross materialism side by side with belief in the Bible, very remarkable successes wherever they have settled, while the leaders themselves are animated by questionable motives—all these circumstances have long attracted to the young State rising by the Salt Lake amidst the Cordilleras the earnest attention of all interested in the affairs of the New World, and have been the occasion of legislation.



CURIOUS MORMON CHARACTERS.

Joseph Smith, founder of Mormonism, was the son of a farmer of Sharon, Windsor County, Vermont. When a comparatively young man, then residing in western New York, he began to surround himself with followers, who gave out that he was a prophet sent of God, or rather a second Messiah. In order to support his pretensions with the necessary mystifications, he produced certain golden plates professing to contain the laws and records directly dictated by God Himself. Six bronze plates were found in the State of Illinois in 1843, which are said by old Mormons to closely reproduce the strange characters and resemble the original plates of the Book of Mormon. He further pretended that he had been enabled to decipher these records by means of an instrument revealed to him in a vision. The plates were said to have been written soon after the destruction of Jerusalem by Mormon, a Jewish prophet, and by him brought to America, where they were afterwards buried. Smith selected twelve apostles, and by means of pretended miracles and many fresh revelations soon attracted a large number of the curious, many of whom became believers.

Thenceforward he was on very familiar terms with such beings as angels, spirits and devils; but can only relate one interview with Jesus

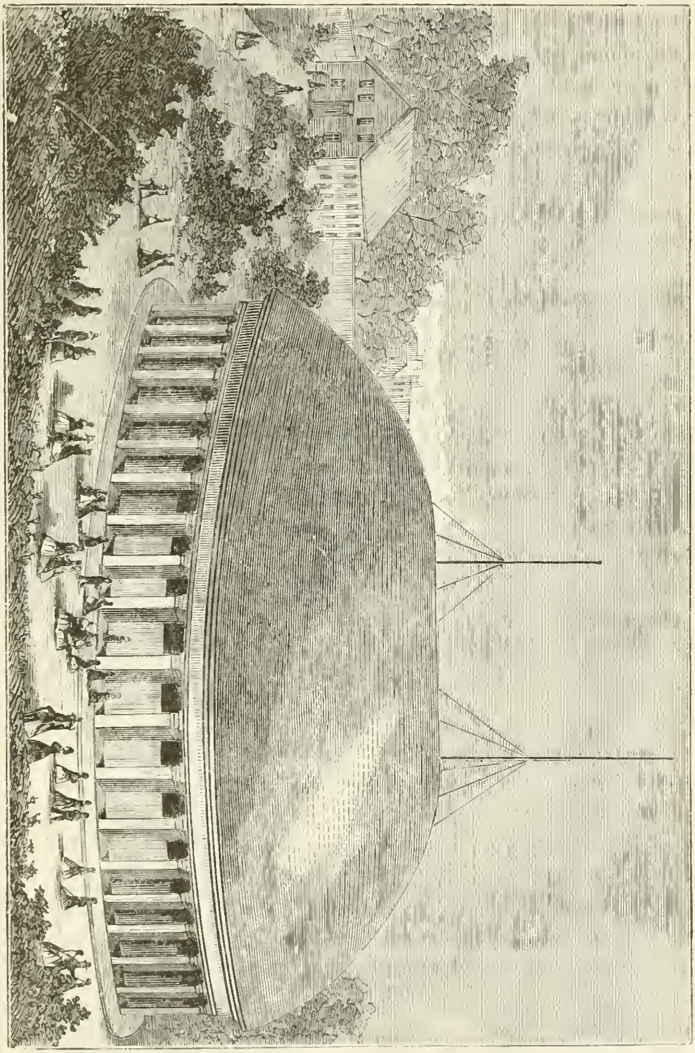
Christ. Being at work among the neighboring farmers meanwhile, and meeting other lads in a social way, he spoke of his peculiar privileges quite often, and became in consequence an object of general ridicule. Finally, in September, 1826, the angel conducted him to the Hill Cumorah—known to the citizens of Manchester, Ontario county, New York, as the Big Hill—and there the chest and the plates were uncovered. Later revelations add that there was a marvelous display of celestial machinery, devils struggling with angels to prevent the work; and that the devils were captured and compelled to file in procession before him so he could know them thereafter. To this day, the common explanation among the Mormons of any opposition to the priesthood is, "It's the work of the devil."

THE ASTOUNDING MORMON REVELATION.

The plates were of the thickness of tin, bound together like a book, fastened at one side by three rings which run through the whole, forming a volume about six inches thick. The record was engraved on the plates in "reformed Egyptian" characters, consisting of "the language of the Jews and the writing of the Egyptians." In the same box with the plates were found two stones, "transparent and clear as crystal, the Urim and Thummim, used by seers in ancient times, the instruments of revelations of things distant, past and future." When the news of this discovery spread abroad, the Prophet was the sport of lies, slanders and mobs, and vain attempts to suppress him, but many were credulous, became his followers, and emigrated with him to Ohio.

Driven from the State of Ohio, the Mormons pitched their tents in the, at that time, still uncultivated district of Nauvoo, "the beautiful," on the banks of the Mississippi, in Illinois. Here they increased rapidly, and even began to erect a vast temple, large enough to contain the whole people. Polygamy was already laid to the charge of Smith's adherents, together with many other unpopular institutions, exciting the ill-feeling and antipathy of the people on both sides of the Mississippi. Soon another emigration took place, the Mormons this time locating in Utah, a Territory of many singular advantages and capable of vast development and cultivation.

Salt Lake City has grown rapidly, and it must be admitted that Brigham Young, Joseph Smith's successor, proved himself to be an able administrator. He saw the possibility of interference on the part of the Government in the affairs of Utah, and had not been long in the Territory when, learning that the Pacific Railroad was an assured fact, he began to contemplate another removal of his polygamous community. Meanwhile the city at Salt Lake grew to large proportions. Wide streets intersect the town, stores and various manufacturing establishments have been erected, and an appearance of business characterizes the place. A principal object of interest is the great Mormon Tabernacle, the immense building capable of holding ten thousand people, where the faithful, led by their prophet and elders, assemble for worship. Near it stands the Endowment House, which is occupied by various offices—a plain and unpretentious structure.



THE FAMOUS MORMON TEMPLE OF SALT LAKE CITY.

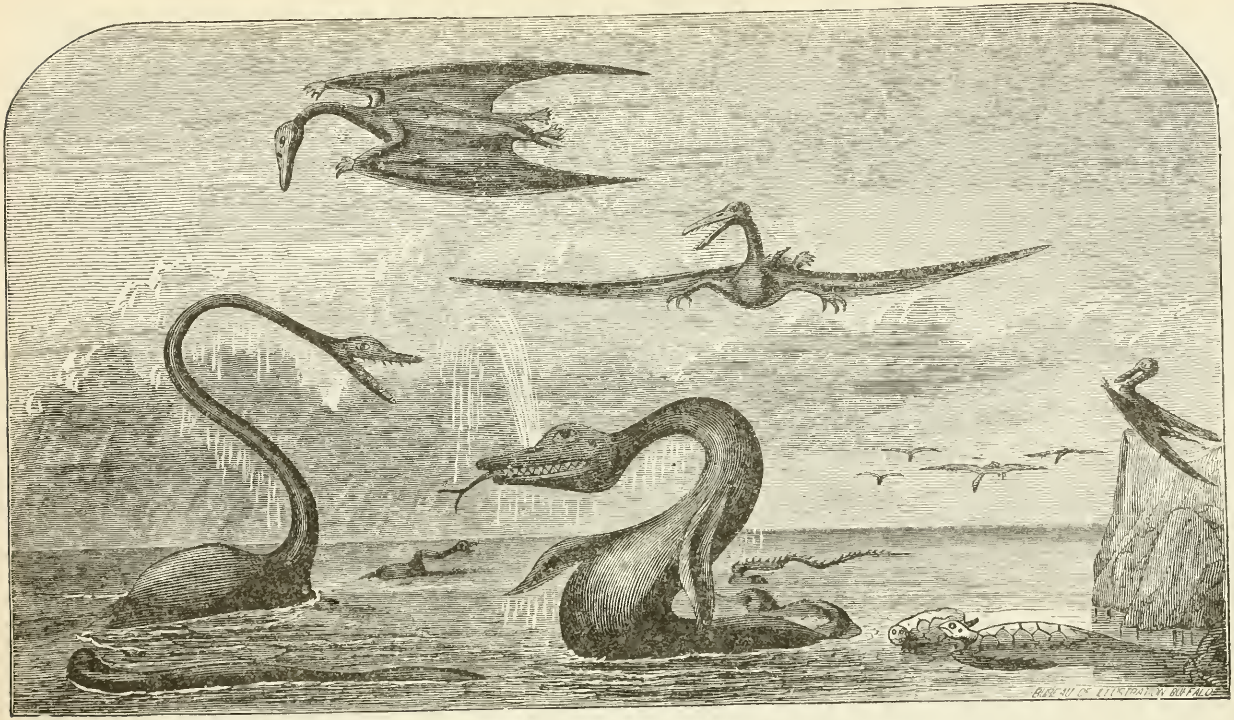
The surface configuration of Utah is a great depression in a mountain land, a trough, so to speak, elevated above sea-level; subtended on all sides by mountain ranges, and subdivided by transverse ranges; in the geologic age, an inland sea, in aboriginal times the retreat of the most abject savages—long a region of misconception and fable—then the chosen home of a strange religion, and but yesterday found to be of use and interest to the civilized world. Leaving the mountain ranges which bound the Great Basin, there is a general breaking down, so to speak, towards the interior; few of these ridges present regular slopes, but are formed of acute and angular cappings, superimposed upon flatter prisons; and frequently after ascending two-thirds from the base, the upper part becomes wall-like and insurmountable. Of these peaks or terminal headlands, the most noted are the Twin Peaks, south-east of Salt Lake City, which are a wonder worth a journey to see.

The Salt Lake Basin, including many adjacent and connecting valleys, was evidently an inland sea, as shown by the "bench formation," a system of water-marks along the mountains, points of successive subsidence of the waters; while many of the detached mountain peaks were as evidently islands, similar to those now rising above the surface of the lake. According to some, the dry land was formed by successive upheavals; according to others, by ages of evaporation.

Here, thousands of years ago, was an extraordinary race of animals, as evinced by the geologic discoveries of recent date. The remains of extinct tribes that traveled the water and swept on strong wing through the air, are among the most remarkable relics ever brought to light. From these we can form some idea of the denizens of this vast and marvelous region ages before the western world was the dream of the navigator. Animal life took on the most extraordinary shapes and appearances, and if it could be reproduced in reality, as it is by the pencil of the geologist, the world would stand in profound amazement at the spectacle, and the great changes in the animal kingdom.

IMPOSING MOUNTAINS AND RIVERS OF ICE.

Turning our attention now to the Pacific Ranges, we come to objects of great interest and scenes of remarkable grandeur. Mount Baker rises before us, ten thousand five hundred feet above the sea-level, and near it stands Sherman Peak, about the same height. The summit of Sherman Peak, a steep icy cone, which can be reached only by hewing steps in the ice, presents a flat surface, its snowy mantle unruffled by a single rocky protuberance. At the foot of Sherman Peak, some distance from Mount Baker, lies the crater, its blackened walls here and there colored by sulphur. Through a fissure in the side of this crater prodigious masses of lava have been poured forth, the sulphurous odor, combined with the smoke and absence of snow, clearly showing that the fires still slumber in the bosom of the mountain. The Lava Beds,

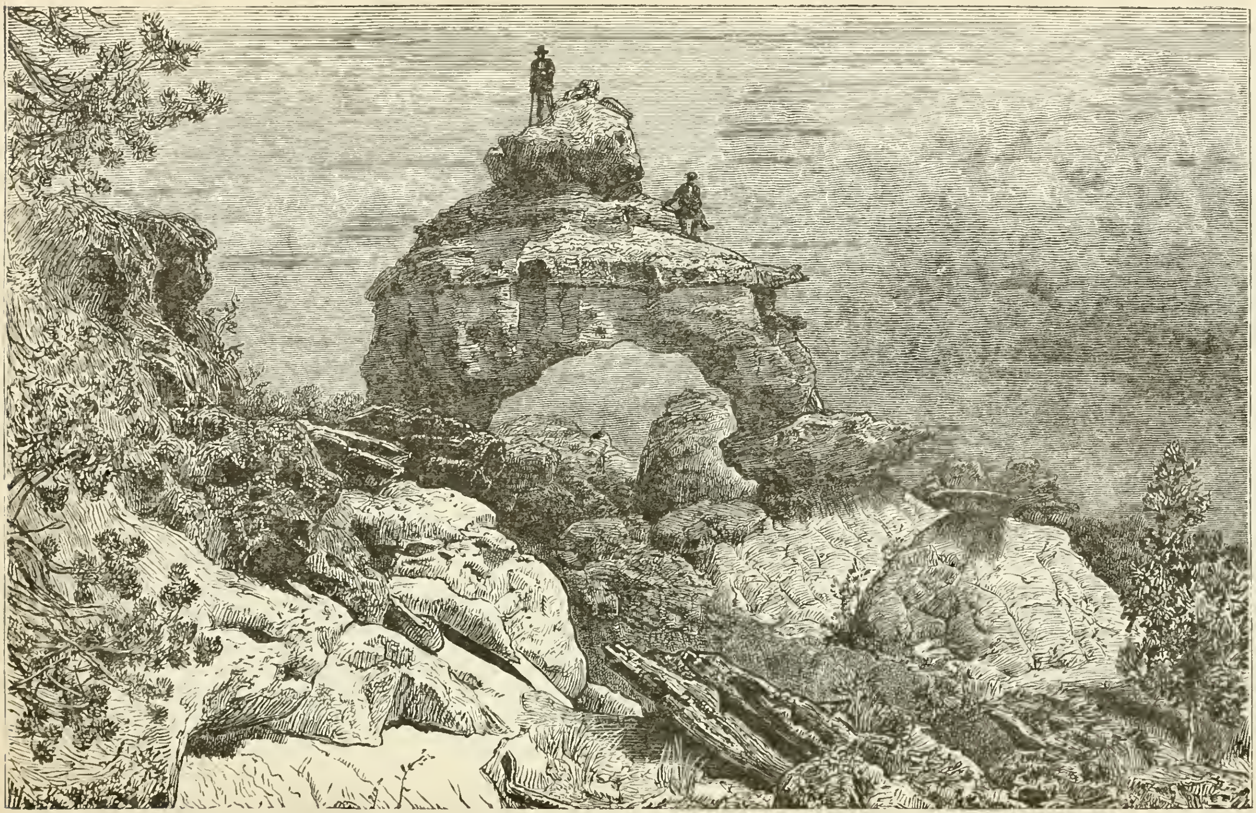

BUREAU OF ILLUSTRATION BUFFALO

THE WONDERFUL INHABITANTS OF THE SALT LAKE BASIN IN EARLY PERIODS.

renowned as the locality of the Modoc troubles, are curious formations of volcanic deposits, rocky in appearance, and sometimes highly elevated, with immense arches opening through them. Mount Rainier is four feet higher than Mount Shasta, and consequently the most elevated point in the Cascade Range of the States. It has a glacier ten miles in length by five broad, many others of a like character being elsewhere found in this range. That glaciers really exist in the giant mountains of the Pacific States had already been ascertained by the late Lieutenant A. von Kantz some twenty years ago, when, on attempting to scale Mount Rainier, he found his way barred by large glaciers. The land east of the Scott Mountains, consequently in the direction of the northern spurs of the Sierra Nevada, comprises a broad, volcanic plain, here and there broken by considerable mountain chains. Above the main plain itself, at an elevation of nearly fifteen thousand feet above the sea, towers Mount Shasta, the solitary cone of an enormous extinct volcano, lying almost exactly in the line of the axis of the Sierra Nevada. At its foot are grouped hundreds of little volcanic hills, which, however, pass almost unnoticed beneath the shadow of the great peak. The volcanic plain is partly wooded and partly overgrown with grass and wild sage. But in whatever direction we go, the one central point in the landscape is the great cone of Mount Shasta. Its solid, snow-capped peak, its stupendous elevation, the pale gray or rosy tints of its lava fields, and the dark, wooded belt encircling it far above the numerous satellites at its base, impart to this imposing mountain a grandeur scarcely equaled by any other elevation in the New World.

THE FAR-FAMED YOSEMITE VALLEY.

The Yosemite Valley is nearly in the centre of the State of California north and south, and just midway between the east and west bases of the Sierras, here a little over seventy miles wide. The valley is a nearly level area about six miles in length, and from half a mile to a mile in width, and sunken almost a mile in perpendicular depth below the general level of the adjacent region. It may be roughly likened to a gigantic trough hollowed in the mountains, nearly at right angles to their regular trend. This trough is quite irregular, having several re-entering angles and square recesses, let back, as it were, into its sides; still a general north-east by easterly direction is maintained in the depression, until we arrive near its upper end, where it turns sharply, at right angles almost, and soon divides into three branches, through either of which we may, going up a series of gigantic steps, as it were, ascend to the general level of the Sierra. Down each of these branches, or cañons, descend streams, forks of the Merced, coming down the steps in a series of stupendous waterfalls. At its lower



THE EXTRAORDINARY LAVA FORMATIONS—SCENE OF THE MODOC INDIAN WAR.

end, the valley contracts into a narrow gorge or cañon, with steeply inclined walls, and not having the U-shape of the Yosemite, but the usual V-form of Californian valleys.

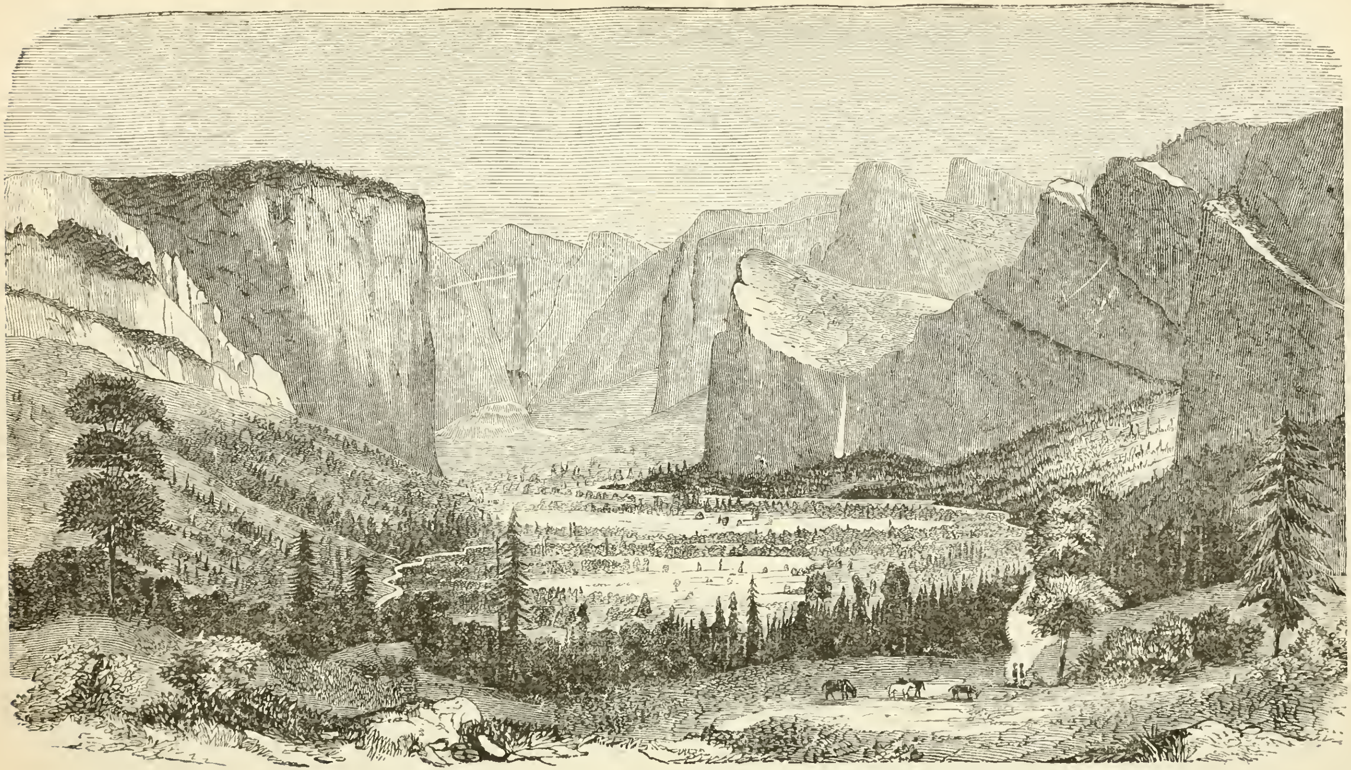
The principal features of the Yosemite, and those by which it is distinguished from all other known valleys, are—first, the near approach to verticality of its walls; second, their great height, not only absolutely, but as compared with the width of the valley itself; and finally, the very small amount of talus or debris at the base of these gigantic cliffs. These are the great characteristics of the Yosemite throughout its whole length, but, besides these, there are many other striking peculiarities and features both of sublimity and beauty, which cannot be surpassed, if equaled, by those of any mountain valley in the world. Either the domes or the waterfalls of the Yosemite, or any single one of them even, would be sufficient in any European country to attract travelers from far and wide in all directions. Waterfalls in the vicinity of the Yosemite, surpassing in beauty many of those best known and most visited in Europe, are actually left entirely unnoticed by travelers because there are so many other objects of interest.

The objects of interest in this valley, which render it without a rival in scenic effects in the known world, are—first, the great cliffs and crags which border it; second, the wonderful bas-relief of columns, spires, and arches upon its granite walls; and third, the grand and beautiful waterfalls by which the many tributaries to the Merced enter the valley, leaping over its walls from great heights.

STUPENDOUS WATERFALLS AND ROCKY PEAKS.

A close observer who has explored this whole region gives us a graphic account of some of its wonderful features. The Sierras, he says, have a general course from north to south, and a height of from ten to fourteen thousand feet; and from them a succession of rivers put out westward, each marking in its upper part the course of a mountain gorge or clear-cut cañon, widening westward to a broad valley bounded by slopes and foot-hills of genial clime and rare fertility. Between this and the ocean is the Coast Range, nearly half the height of the Sierras, shutting off the sea breeze and accompanying fog; and between these lies the great interior valley, which is, in fact, California, or four-fifths of it.

After passing Table Mountain we came upon a precipice where the eye, glancing downward two thousand feet, perceives the Stanislaus like a narrow silvery band flowing down a rocky trough. But how shall we reach it, is the question; for the sides of this forbidding gulch stand at a threatening angle of at least seventy degrees, and, except the sharp turn to our left, where the road seems to disappear in the rock,



A GENERAL VIEW OF THE MAGNIFICENT YOSEMITE VALLEY, there is no trace of passage. In fact the stage road is but a series of grooves cut zigzag into the solid rock or mixed earth and boulders.

We have four of the stoutest mountain horses kept especially for this stage. A few scrub oaks of a foot or more in thickness are the only common timber we see, and vast forests of red-wood and sugar-pine, from two to eight feet in thickness, shade the way. The air is delightful. The dust and heat of below give way to a cool breeze from the cliffs; for we are half way up the Sierras, and this giant vegetation wards off the fervid rays of a Californian sun. At every pause we hear a strange, solemn, murmur from far above our heads, a gentle swell and rustle as the mountain breeze thrills the tree-tops, like the far off diapason of a monstrous organ, or a gentle tremolo stealing upon the senses with a music all the more impressive that it cannot be analyzed or described. Before noon we are in the edge of the Tuolumne Grove, and the driver having made good time, gives frequent halts for us to look about and gather curiosities, of which there are many.

A TERRIBLE DESCENT.

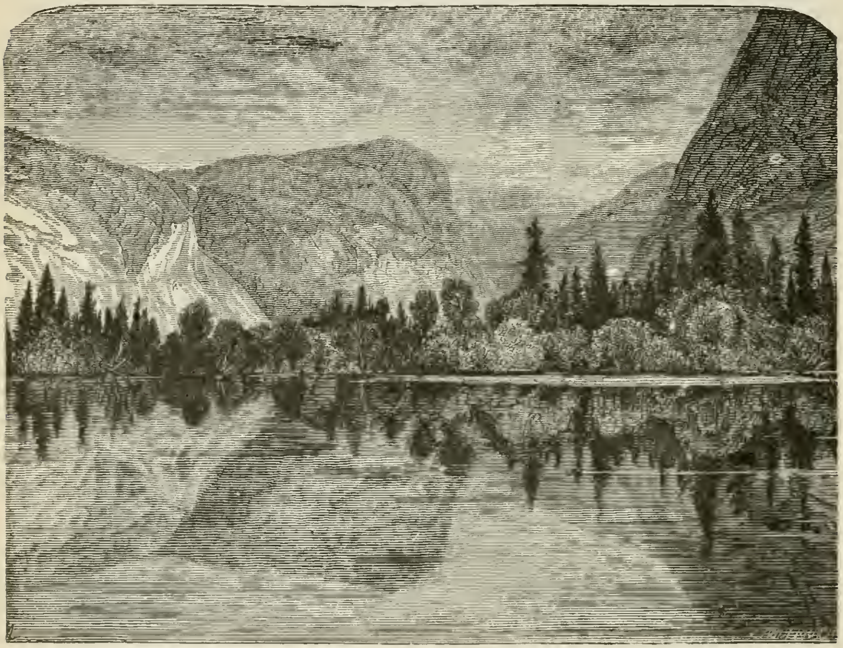
We turn again to the left into a sort of stairway in the mountain side, and cautiously tread the stony defile downward; at places over loose boulders, at others around or over the points of shelving rock, where one false step would send horse and rider a mangled mass two thousand feet below, and more rarely over ground covered with bushes and grade moderate enough to afford a brief rest. It is impossible to repress fear. Every nerve is tense; the muscles involuntarily make ready for a spring, and even the bravest lean timorously toward the mountain side and away from the cliff, with foot loose in stirrup and eye alert, ready for a spring in case of peril. The thought is vain: should the horse go, the rider would infallibly go with him. And the poor brutes seem to fully realize their danger and ours, as with wary steps and tremulous ears, emitting almost human sighs, with more than brute caution they deliberately place one foot before the other, calculating seemingly at each step the desperate chances and intensely conscious of our mutual peril. We learn with wonder that of all the five thousand who have made this perilous passage not one has been injured—if injured be the word, for the only injury here would be certain death. One false step and we are gone bounding over rocks, whirling from cliffs, till all semblance of humanity is lost upon the flat rock below. Such a route would be impossible to any but those mountain-trained mustangs, to which a broken stone staircase seems as safe as an ordinary macadamized road. At last comes a gentler slope, then a crystal spring, dense grove and grass-covered plat, and we are down into the valley. Gladly we take the stage, and are whirled along in the gathering twilight. To our right Bridal Vail Fall, shedding a brilliant sheen in the twilight; further up Inspiration Point, and to the left El Capitan rearing his bare, bald head three thousand three hundred feet above us, beautifully, purely gray, in clear outline against the rosy sky, form the stupendous features of this celebrated scene.

THE MARVELOUS YOSEMITE FALLS.

We rise to view a new creation—as it seems—a wondrous rift in the earth, a great void five miles long and one and a-half wide in the centre, walled in by ever-enduring granite three thousand feet high, impassable but at a few points, with rocky, narrow outlet westward and two sharp inlets from the eastward, where the Merced pours down from snowy peaks still eight thousand feet higher. Here is a minor cosmos, shut off from the greater, where nature seems to have proceeded on a more extensive plan, as if determined to outdo all in the outer world of common-place. A forenoon we give to rest and gazing, for there is enough to be seen for that time from the porch of the hotel. After noon we start out northward, to the foot of the truly wonderful Yosemite Falls, one and a half mile from us. The cliffs in front rise nearly three thousand feet above us, and all along the perpendicular wall we see the marks of ancient glaciers and waves wearing smooth the rocky face; but above, where first the peaks rose from the sea of primal chaos, rough and frowning battlements attest the violence of the rent which divided this from the southern side. About half way up the cliff is a small offset, where grows a beautiful pine, with branch and foliage forming a perfect cone, seeming like the larger growth of ornamental shrubbery. Yet that shrub is a monster tree, one hundred and sixty feet high, and above it the perpendicular cliff is just eleven times its height. Go into the forests of Ohio or Indiana and select the tallest tree, and remember that the upper division merely of Yosemite Fall is at least ten times that height! Or imagine ten Niagaras piled one above another.

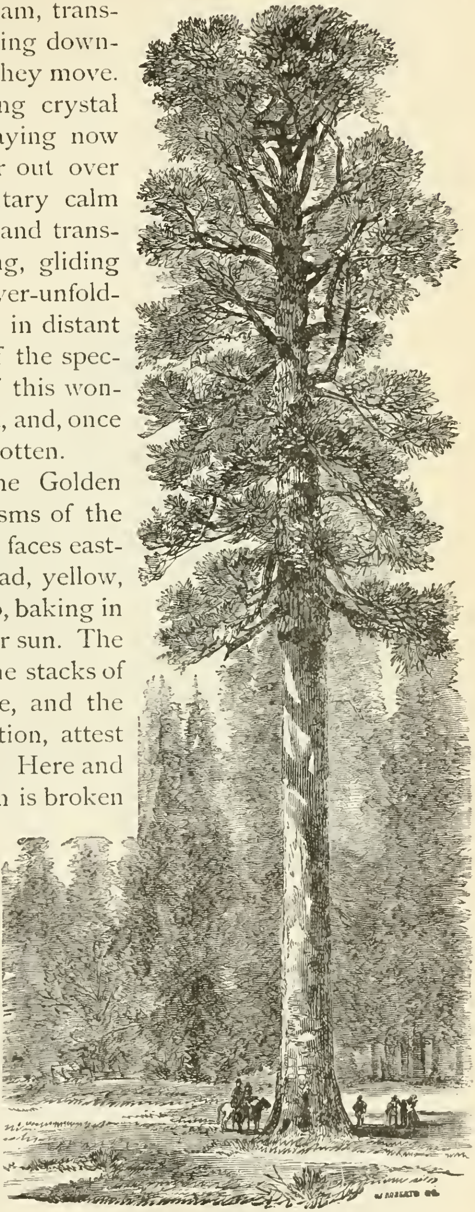
We found Mirror Lake simply a pretty mountain tarn of clear water, to my mind the least of all the wonders of Yosemite, though greatly praised. We are assured, however, that we saw it at a most unpropitious time. The day was not clear and the water was discolored—being low—by tamarack trees in its source at Lake Tinayah some miles above and eastward, in the very midst of snow-peaks. Standing on the northern shore we viewed, reflected in the lake from right to left, South Dome, Old Man of the Mountains, Clouds Rest, Mount Watkins, and the Watch Eye, all notable and noble peaks upon the south side rising from two thousand to four thousand feet above the cliffs that bound the valley. Crossing in a skiff to the south side we see reflected from the north, Mount Washington, Mount Calhoun, and the far-reaching wall of the lower valley. The lake is a great crystal map of all the adjacent hills and cliffs, beautiful only because of beautiful surroundings, not remarkable in itself, but dazzling by reflection of greater glories.

From Mirror Lake we come back on the same trail a little way, then straight south across the valley till we are directly under the southern cliff which, instead of being perpendicular, here overhangs and seems momentarily to threaten destruction; then eastward up what may be called the main branch of the Merced to the head of the valley. The smaller branch comes in from the north-east under the shadow of the North Dome and the Cap of Liberty—the last a wondrous cone rising directly from the north cliff, one thousand feet. Two hours of toil bring us upon the level above the Vernal, and turning a sharp, rocky point, we come in sight of Nevada Falls, and in a few moments are directly at its foot—for here the approach is easy. All that we have seen seems as nothing to this, the largest and highest fall in one body. Rushing down a rocky flume from heights four thousand feet above and miles away, the Merced comes clear as alcohol to the edge and takes the first plunge, four hundred feet clear; then dashes against the rocks, and rebounding in comminuted foam of dazzling white, then collecting again



THE BEAUTIFUL MIRROR LAKE—A GEM OF YOSEMITE.

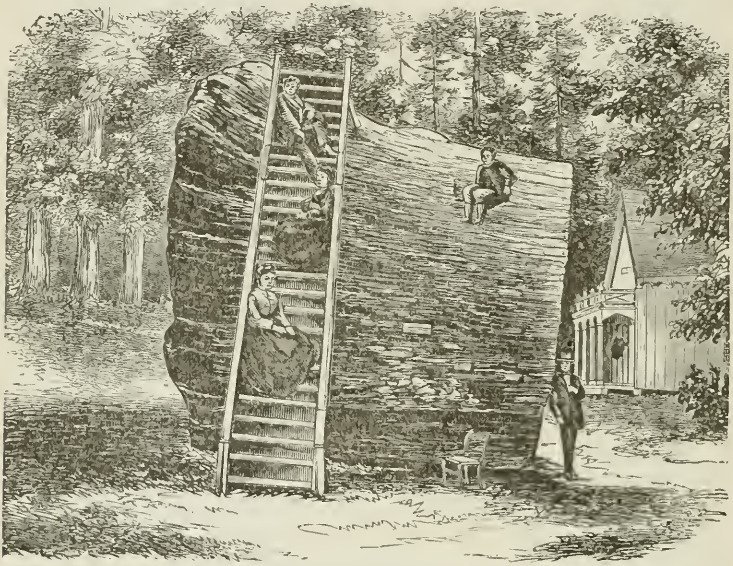
to a hundred tiny streams, it is off at last from the rocky face in filmy, slanting lines of cloud and foam, transparent mists, so delicately flowing downward that one can scarcely say they move. The silvery sheen like a hanging crystal web, is lifted by the wind, swaying now against the rocks and now far out over the valley; then in a momentary calm falls back to break into a thousand transparent, fluted sections, creeping, gliding downward over the rocks in ever-unfolding, ever-renewing liquid lawn, in distant seeming like the mimic vails of the spectacular drama. The height of this wonderful fall is seven hundred feet, and, once looked upon, can never be forgotten.


A MONSTER TREE OF THE SIERRAS.

Leaving the beauties of the Golden Gate, and the picturesque chasms of the Coast Ranges, and turning our faces eastward, we cross at first the broad, yellow, naked plains of the Sacramento, baking in the intense heat of a midsummer sun. The harvests are all gathered, and the stacks of grain in the fields everywhere, and the loaded grain-cars at every station, attest the abundance of the harvest. Here and there the monotony of the plain is broken by a patch of the evergreen oak, but it is not until we reach the slopes of the Sierras that true tree vegetation is met with. On the foothills of the range are found in scattered groups the digger pine and the black oak. The pale-bluish tint of the pine contrasts finely with the dark green of the oak, and both stand out in fine relief against the yellow background of the soil. Further up the mountain-side we reach a moister region, where trees grow more densely, and are more finely developed. Here abound the pitch pine, the sugar pine, the white cedar and the Douglas spruce. This is the true forest belt of the Sierras, and it is in this belt that the "Big Trees" are found.

Next in our ascent we reach the region of the firs, and the tamarack pine, in the middle of the State; and above this belt we find yet another growth struggling with the winds and frosts for an existence on these mountain heights. The groves of the Big Trees are limited in geographical range, both horizontally and vertically. There are eight distinct groves known to exist, and they are all at a high elevation.

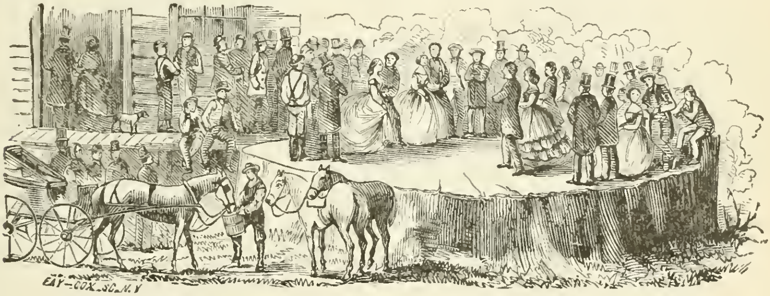
The Calaveras Grove is the one most visited and best known. It is on the western slope of the Sierras, in Calaveras County. There are between ninety and one hundred trees of large size in the grove, besides many smaller ones. One of the largest and finest has been cut down by vandals; its greatest rival has had the bark peeled from it so as to destroy it. Thirty-one of the trees in this grove have been measured. The highest is fifteen feet in diameter at six feet from the ground, and three hundred and twenty-five feet in height. Others, though not as high, exceed this in diameter; the "Mother of the Forest" being, without the bark, twenty feet through. The smallest of the thirty-one trees measured is ten feet in diameter and two hundred and thirty-one feet in height.



A WONDERFUL STUMP.

There they stand, the vegetable wonders of the world, in the gathering twilight, some in clusters, joining their branches like the columns of great gothic arches reaching away to prop the firmament, or now and then one isolated and stretching out gaunt arms and opening boughs as if it would drink the clouds. The majority appear stumpy and truncated, too thick for their length; but others stretch away in long, graceful columns of arborescent proportions, height, thickness and branches all in such perfect correspondence, that half the effect of their size is lost. Indeed, they do not look at first sight nearly as large as they are; there is such harmony in adjacent trees, and between different parts of the same tree, that the sense of size is lessened by that of elegant uniformity. But many of the trees of two or three hundred feet in height, have a decidedly stumpy appearance, looking like gigantic stubs.

"Uncle Tom's Cabin" is a hollow stump in which twenty-five persons can be comfortably seated; while near by the "Three Sisters" stand side by side in graceful amplitude, each twenty feet thick and two hundred feet high, of exact proportions and equidistant from base to crown. One of the gigantic monarchs of the forest was cut near the ground, and the diameter of the stump was such that a dancing party occupied it on one occasion, and there found ample room for a cotillon set, with numerous spectators.



A COTILLON PARTY DANCING ON THE MAMMOTH TREE.

The region of the Cordilleras produces nearly all the metals known to commerce, and its mineral resources are as varied as those of any part of the world. Gold and silver are found in greater or less abundance in nearly every State and Territory in the mountain region and along the coast. California and Nevada stand at the head of the gold-producing States, the latter also rivaling Mexico in its silver yield. In addition to gold, California yields copper, mercury, tin, iron, salt and petroleum. Mercury is found at a number of localities in the Coast Range, especially at New Almaden and New Idria, two places named after the two most productive European localities. Colorado is rich, not only in gold and silver, but in her coal-fields, which is also the case with Wyoming and Utah. The coal is known as bituminous lignite, and is found widely distributed and in great quantity. No anthracite is found except in small deposits, where it has been metamorphosed by local volcanic action.

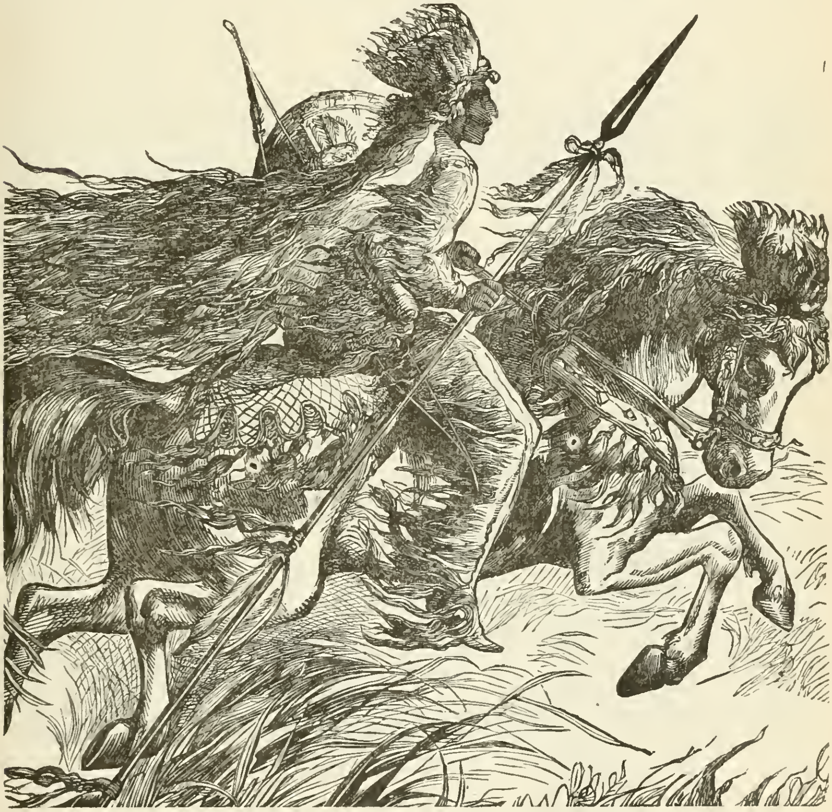
Gold is found widely distributed throughout the Cordilleran region. The placers, which contain it in its native state, disseminated in sand and gravel, are the richest and most profitable sources of the metal. Placers have been found of greater or less extent in every State and Territory of the mountain region. Silver is as widely distributed through the Cordilleran region as gold. Nevada, Colorado and Utah are at present the principal silver producing States. Nevada yields more than one-half of the silver product of the United States. The Comstock Lode at Virginia City, Nevada, is probably the richest deposit of silver in the world. The estimated product of the lode during the thirteen years immediately following its discovery was more than one hundred and sixty-nine million, or about the same as that of the score of veins at Potosi, Mexico, for the first fifteen years after their discovery in 1545.

There is no other authentic record of the extraction in one year of nearly twenty-three millions in gold and silver from one lode, which was the product of the Comstock in 1874. The bullion has one-third of its value in gold and two-thirds in silver.

THE INDIAN TRIBES OF THE GREAT WEST.

The red man must fairly be classed as one of the wonders of our American frontier and undeveloped territory. The Indian is a savage, with all that the name implies. He is cruel and treacherous in the extreme, and naturally so, as war and hunting are almost his sole occupations. He has the reputation of being extremely taciturn and reserved, and so he is when among the whites, but when at home he is quite the reverse. He is possessed of immense power of enduring fatigue and exposure, and no amount of physical pain will draw from him a groan. He has the utmost cunning and perseverance, qualities which his occupations develop to a remarkable degree. Possessed of much animal courage, so as to love war for its own sake, he has little of that higher mental courage which is governed by the will, and which enables a man to brave death without flinching. In war he seldom engages in a pitched battle; ambuscades and surprises, where he takes little or no risk, are his methods of waging war. He fights behind trees and rocks; he creeps up, and stabs you in the back, or "jumps" your camp at midnight, when all are asleep. He is a capital horseman; not unfrequently one sees boys of eight or ten riding, without saddle or bridle, save a bit of raw hide, their half-broken ponies on the race-course. Horses are his wealth, and many Indians are very wealthy.

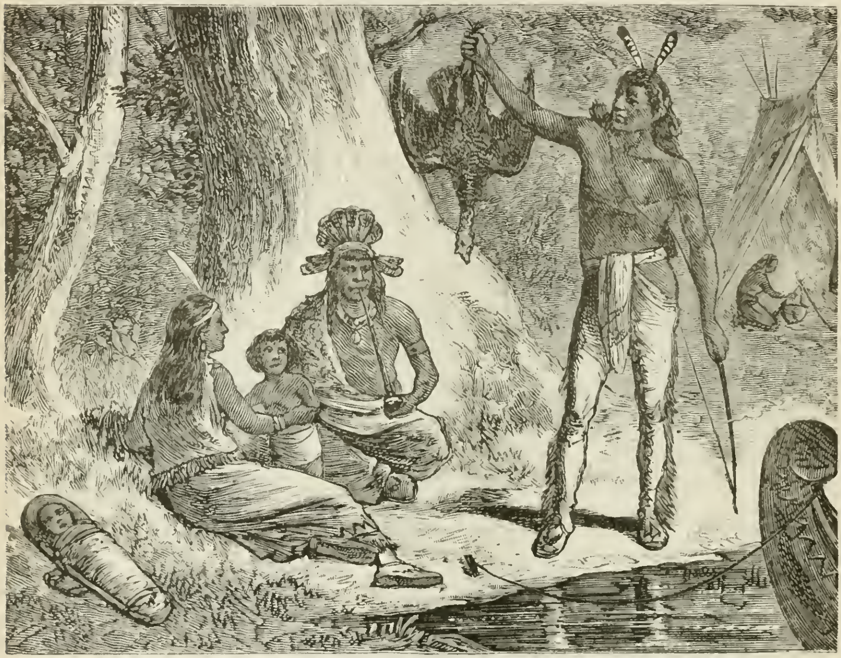
They are used in war, in hunting, and in traveling, to carry not only the Indian and his family, but all his household goods, and a moving Indian village makes a large cavalcade. The Crow tribe is remarkable for fine horsemanship, and few objects are more striking and picturesque than one of their chiefs mounted on his steed and dashing over the plain. On his left arm he carries his bow, which he knows how to use with wonderful precision; his right hand grasps a spear, with long and deadly point; his head is fantastically decorated, and streamers fly out far behind, and his horse is gorgeously arrayed.



A CROW CHIEF DASHING TO THE FRONT.

At home, the Indian stoops to none of the menial duties connected with housekeeping. His squaw must take the loads off the pack ponies, put up the lodge, bring wood and water, and cook, while her lord and master reclines on the ground and smokes. The squaws are, like women in most barbarous tribes, little better than slaves. The practice of scalping, which is almost peculiar to Indians, is not, as some suppose, a method of torturing their victims, as is shown at once by the fact that it is performed only on those supposed to be dead. The scalp—that is, the skin of the top of the head, with the hair—is taken simply to prove the killing, as the hunter is required to show the ears of the wolf in order to claim the bounty.

The sole end and object of his existence, the point on which all his thoughts and energies are concentrated, is to appear formidable to his enemies, and attractive to the women. If he can scare his foes by the hideousness of his war-paint and the ferocity of his appearance, he is delighted, because he may, perhaps without risk to himself shoot one of them in the back while running away; and having done so, he and his friends would scalp the body, and kick it, and dance around it, and stamp upon it, and abuse it, and stick it full of knives and arrows, and have a "gay old time generally," and then go home and be afraid of the dead man's ghost. At any rate, he would argue that, even if he killed no one, he would not be killed himself, which would be a highly satisfactory reflection to his selfish mind. And if he sees that the bright vermilion partings of his hair, and the carefully designed and artfully painted stripes and patches on his face and chest, are making an impression; if shy glances of approval note the swing of his gay



WILD INDIAN LIFE IN THE NORTH-WEST FORESTS.

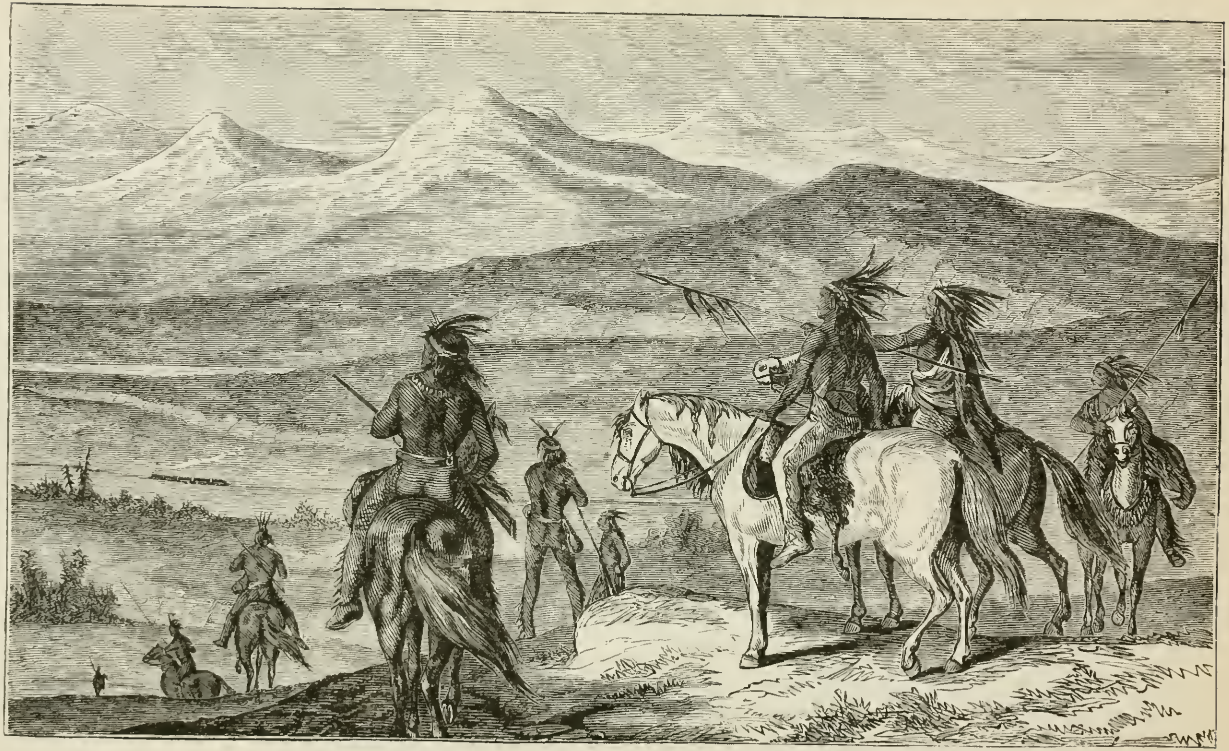
blanket and the style of his leggings, and if soft eyes brighten at the sight of his shell earrings, and the silver plates in his back hair, he is also delighted, because—well, for the same reason anybody else would be. Then he considers himself a person of the utmost consequence.

In short, he is the greatest coxcomb on the face of the earth, not to be surpassed even in an eastern city for inordinate vanity, stupendous egotism, and love of self. His features may not be strictly classical, according to our standard of beauty. His cheek-bones might be considered somewhat too prominent, and his paint certainly is inadmissible with us; but, to do him justice, we must allow that he is not a bad-looking fellow in his way. Take, as an example, a young warrior of the Bannacks riding through a street in Virginia City from their camp in the neighborhood. Smooth and easy as a hawk's flight he sweeps along, sitting his foam-flecked mustang with the yielding gracefulness of a willow bending to the breeze, swaying his lithe body with every bound of the animal beneath him. Before him, across the pommel of his saddle, he bears his rifle in embroidered elk-skin cover, adorned with long fringes, which, mingling with the horse's mane, and the tags and tassels of his gay leggings, spread out behind him on each side. His long, black hair, plaited and tied with knots of scarlet ribbon, streams out in the wind, and, uniting with the horse's tail, seems almost to touch the dust. He is evidently quite at home in the saddle.

Slung across his back are the lion-skin quiver and bow; by his side hangs a revolver, silver-mounted, and shining in the sun. With the toes of his beaded moccasins he touches the loops that serve him for stirrups; his left hand lightly holds the bridle; and from his right wrist hangs by a thong his buckhorn-handled quirt or whip. As he gallops down the street, all his gay trappings fly out in disorder behind him; and when, with a pull at the cruel Spanish bit, he steadies into a walk, the folds of his scarlet blanket settle down, and hang gracefully from his shoulders, and he passes, an embodiment of savage life, full of wild beauty and bright color, and no doubt attractive to the female eye; glancing with supreme and undisguised contempt upon the plug hat, black store coat and pants of some newly arrived representative of civilization. Altogether he forms a very striking figure.

THE INDIAN TRIBES NOT DYING OUT.

It has long been accepted as a self-evident proposition that the red race was rapidly disappearing before the advancing strides of civilization; that, in the struggle for existence on this continent, barbarism is giving way, not so much by the advance of culture as by want of vitality of the lower race; and this example has been used to point many a sermon on the influence of civilization on barbaric races. But lately it



THE NOBLE RED MAN OF THE FAR WEST.

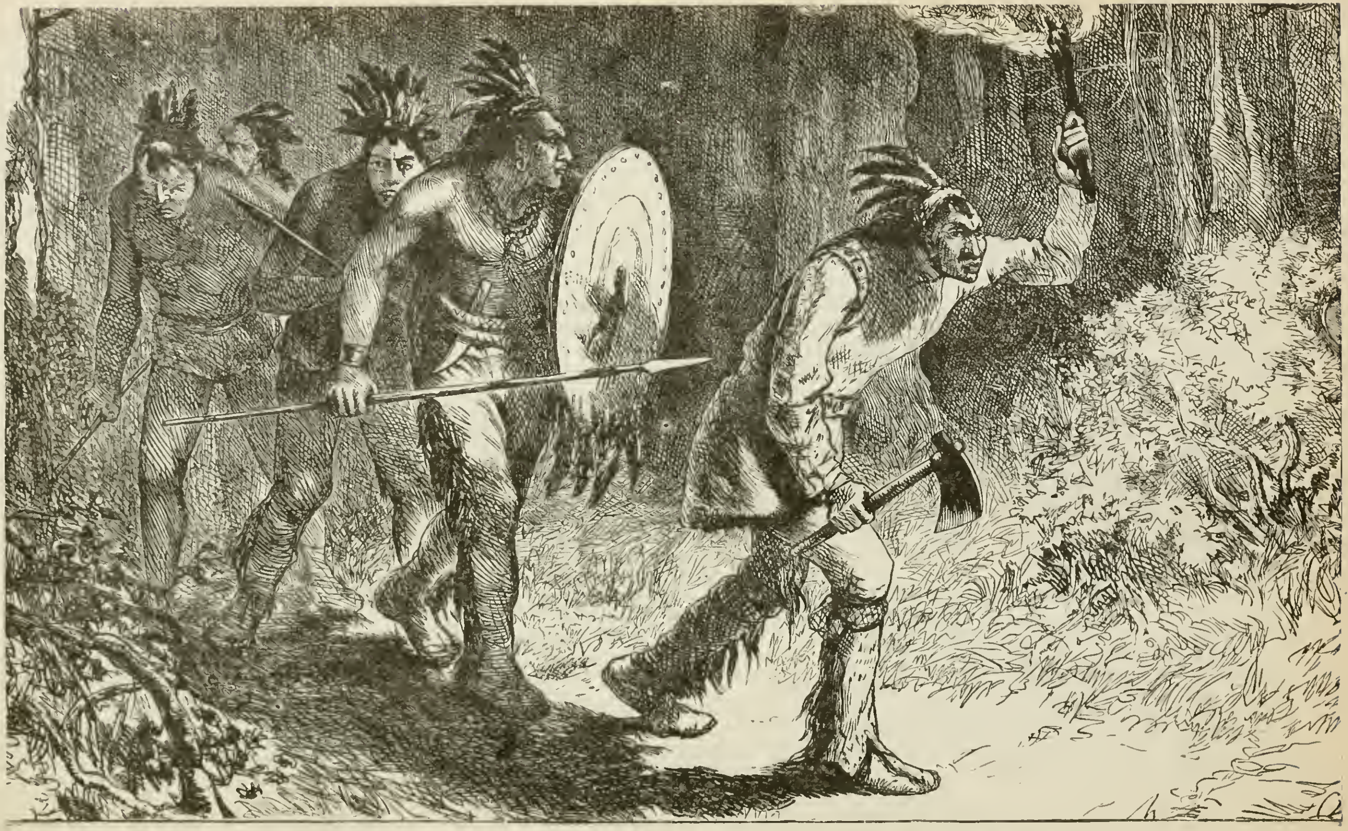
has been boldly stated—and the idea has found many and able supporters—that the Indians are not dying out, but that they are holding their own—yes, even increasing in number.

In Indian Territory, where many of the tribes have been congregated on reservations, there has been considerable advance towards civilization. The Cherokee, Choctaw, Seminole, Creek and Chickasaw tribes, numbering altogether about fifty-six thousand, have adopted civilized dress, live in houses, cultivate the land, and support large schools. The Pawnees, Pottawotamies, and other tribes, contain a large percentage who have adopted civilization. The Omahas, on a reservation in Nebraska, have of late made rapid strides in the same direction. In Arizona, the Pimo, Mojave and Maricopa Indians are all engaged in the cultivation of the soil. The Sioux of Dakota, heretofore regarded as one of the most untamable of tribes, are beginning their career as farmers and stock-raisers. The Navajoes of New Mexico have long cultivated the soil, having learned this art from their semi-civilized neighbors, the Moquis. Many other tribes, not mentioned here, have made more or less advance towards self-support, so that it can no longer be said that the Indian is untamable.

There are, however, several tribes which as yet have not shown the influence of civilization. Among them may be mentioned prominently the Apaches, of Arizona, the Utes, of Colorado, the Bannacks, of Idaho, the Crows and Blackfeet, of Montana, and several bands of the great Sioux nation, with their allies, the Cheyennes and Arapahoes. The Comanches, of Texas, too, continue to be the same lawless, plundering, wild tribe that they have ever been, the untamed sons of the forest.

THE PREDATORY TRIBES OF THE WEST.

A few little forts occupied by slight garrisons in those immense plains rolling from the Missouri westward to the Rocky Mountains, and beyond them to the snowy Sierras, are totally insufficient to keep the redskin in check, and protect the main highways of traffic leading to the Pacific sea-board. On these highways, stretching right across the continent, there occur those repeated acts of violence which so greatly impede the safe transit of goods and passengers bound westward. The Indians roaming over these regions are amply furnished with provisions, ponies, buffalo meat and furs. They follow the herds of bisons grazing on the prairies in summer northward to the lands between the White River and Yellowstone, in winter southward to the Republican Fork and Arkansas Rivers, thus crossing the vast uplands and the great overland routes. It is when they come upon these post-roads that they fall upon emigrants, traders, trappers and squatters, firing the ranches, stealing cattle, mules and horses, and even laying waste the stage stations.



INDIANS TRACKING FUGITIVES AT NIGHT THROUGH THE FOREST.

These Indians belong mostly to the united hordes of the Sioux, Kiowas, Cheyennes, Arapahoes, Crows and Comanches—cruel, treacherous and savage marauders, that have ever been hostile to the pale-faces, and may continue to be so till the last of their race has disappeared.

Since the conclusion of the Civil War, these red-skins have become more formidable than ever, and especially when some few years ago they went on the war-path and committed many nameless horrors without any provocation on the part of the whites, brutally murdering whole families, falling upon emigrant parties, and repeatedly plundering and destroying the United States mails.

INDIANS WHO RIVAL WHITE MEN.

One of the dominant races are the Navajoes, who roam over a country three hundred miles from east to west, and nearly two hundred from north to south. They are a most interesting race of barbarians, though savage in war and somewhat inclined to thieving. They and the Apaches have been at war from time immemorial. The Navajoes are splendid specimens of physical humanity—the finest race of Indians except, perhaps, the Chippewas, of Northern Minnesota. These are the only Indians who have not the stereotyped "Indian face"—the face we have heard described so often, either overcast with a stern and melancholy gravity, or lively only with an uncertain mixture of cunning and ferocity. Their countenances are generally pleasing, even mild and benevolent. They have many young fellows whose faces show the born humorist. Wit, merriment and practical jokes enliven all their gatherings, and, quite contrary to our ideas of Indian character, they laugh loud and heartily at everything amusing. They are quite inquisitive, too, and seem vastly pleased to either see or hear something new. Both men and women work, and are quite industrious until they have accumulated a fair share of property; then they seem content to take things easy. In short, they are as much unlike the "stage Indian," and as much like a tribe of dark Caucasians as it is possible to conceive.

Their handiwork is very ingenious. They make pottery like that of the Pueblos, from whom it is supposed they learned the art. Their blankets are the wonder of all who see them. They are woven by the squaws in a rude frame, and are so compact that water can be carried in them four or five hours before it begins to leak through. A traveler noticed one woman who was engaged in weaving an unusually fine blanket. A large stout beam is fastened firmly to the joists of the hut, or to the limbs of a tree, as they often do all the weaving out doors. From this, by a leathern loop at each end, is suspended a "turn-stick," about the size of one's wrist. A similar beam below is fastened in the ground or floor, and from it another "turn-stick" is suspended by loops. On the two sticks the warp, or "chain," is stretched very tight, the two sets of strands crossing in the middle. This, with two loose sticks, dividing the "chain," and a curved board, looking like a barrel stave with the edges rounded, constitute the entire loom. The squaw sits before this with her balls of yarn for "filling" conveniently arranged, works them through the strands, and beats them firmly together with the loose board, running it in between the strands with singular dexterity. The woolen yarn for "filling" is made from their own sheep, generally, and is of three colors, black, white and red, from native coloring. Running these together by turns, with nimble fingers the squaw brings out on the blanket squares, diamonds, circles and fanciful curves, and flowers of three colors, with a skill which is simply amazing. Two months are required to complete an ordinary blanket, five feet wide and eight long, which sells from fifteen to fifty dollars, according to the style of materials.

The Indians are capable of civilization, if a proper course were adopted. But there are exceptional branches among them, just as there are among white, black or brown races; certain tribes are doomed to extinction, and chief among these are the Apaches. They have no idea of quiet industry; the conception of civilization does not enter their minds. Every Apache is a born robber and murderer. Extermination, whether in war or under the form of reservations and legal justice, is their certain fate; and the quickest way is, perhaps, the most merciful. It is directly the opposite with the Navajoes. They acquired considerable civilization before they met the whites; they will work readily at any productive employment, and learn the use of tools very readily.

The so-called Mound-Builders formerly occupied the whole of the Mississippi Valley, the coast of the Gulf of Mexico, and the region of the Great Lakes. Their works consist mainly of tumuli symmetrically raised, and often inclosed in mathematical figures, such as the square, the octagon or circle; of pits in the solid rock, and of a variety of tools and utensils, wrought in stone or copper, or moulded in clay. While the character of these structures, as traced over wide areas, differs in minor particulars, still there is a general uniformity which shows them all to be the work of a single people. They are usually found overgrown by forests, and in the living and decaying vegetation is found the record of their disuse for at least a thousand years. The people who built them were evidently a settled people, very different from the wild tribes who inhabited the country when the whites made their appearance.

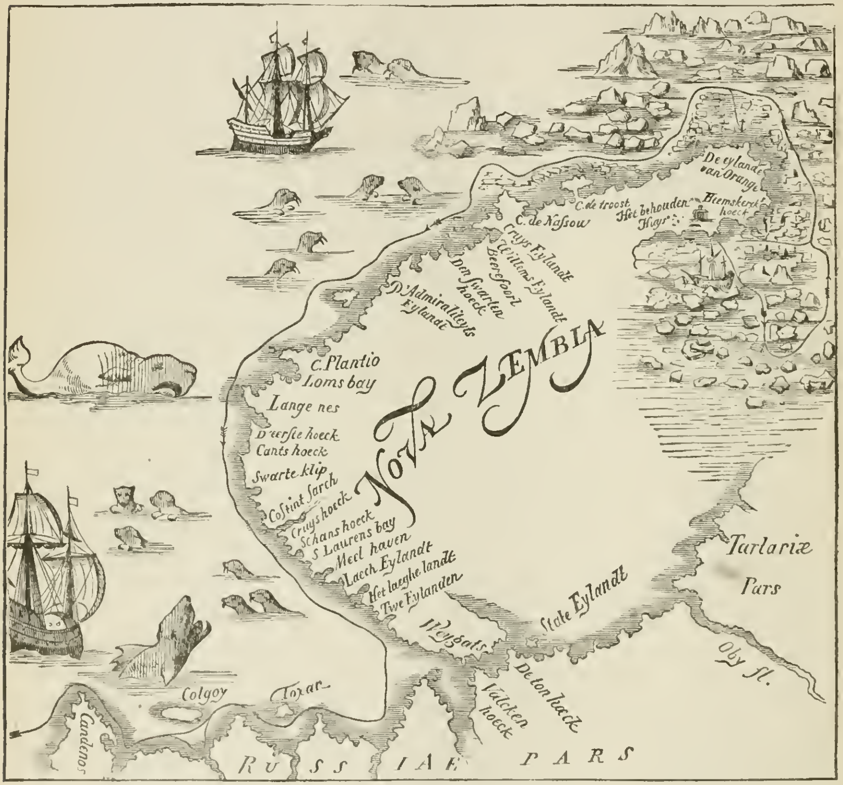
CHAPTER XII.

WONDERS OF THE POLAR WORLD.

Daring Attempts to Reach the North Pole—Early Explorations—Sir John Ross—Captain Parry—Sir John Franklin—Snow-Bound Heroes—A Famous Journey—The Grinnell Expedition—Search for Franklin—Startling Tale of Discovered Relics—Doctor Kane—Dogs and Sledges—Terrible Cold—Bears and Their Young—Incredible Hardships and Perils—Homeward Start—Scientific Results—Wonderful Frozen Sea—The Whale and his Capture—Adventures of an Austrian Hero—Crystal Mountains—Diamonds in Ice—A Remarkable Exploration—Captain Nares—Hall and his Comrades—The Vega—Cutting Through the Ice—The Hut of Barentz—De Long and His Celebrated Adventures—Polar Night, Misery, and Death—The Lost "Jeannette"—Dividing the Last Scrap—The Walrus—A Fierce Attack—Esquimaux—Strange Villages—Brilliant Auroral Splendors—Greely and Cannibalism.

HISTORY presents no record of human achievement more daring and marvelous than that of the bold Arctic navigators who, from time to time, have explored this unknown world of icy desolation. If you examine a map of the Arctic regions, showing what was known of the countries around the North Pole in the commencement of the present century, you will find that nearly all within the Arctic Circle was a blank. The Icelanders and Northmen were the first Arctic explorers, but nothing is known of their discoveries except that they had found a land which they called Greenland. About the middle of the sixteenth century, several learned men, including Sir Humphrey Gilbert, employed their pens in arguing the practicability of a North-western Passage. In his defence of such an attempt he spoke of a friar of Mexico who had actually performed the journey, but who, on telling it to the king of Portugal, had been forbidden to make it known lest it should reach the world. Whatever the facts of this case, some enthusiasm on the subject was the result, and Martin Frobisher spoke of it as the one thing "left undone." But although he also persisted in his advocacy, it took fifteen years of perseverance and constant effort before he could find any one who would give him the assistance he needed. At last, when hope was nearly dead within him, Dudley, Earl of Warwick, came to the rescue, and aided him to fit out two small barques, thirty-five and thirty tons burden respectively. With these small craft, for such a voyage, he left the Thames. As he passed Greenwich Palace, on the 8th of June, 1576, Queen Elizabeth waved her farewell from a window. Briefly, they reached what is believed to have been the southern part of Greenland and Labrador, where they could not land because of the icy field surrounding the coast. Sailing to the north, Frobisher met with a gigantic iceberg, which fell in pieces within their sight, making as much noise as though a high cliff had fallen into the sea. The explorers gave up their undertaking and returned.

In the year 1594 the United Provinces determined to send out an expedition in the hopes of finding a northern route to China and India. Willam Barentz, "a notable, skillful, and wise pilot," went from Amsterdam with two vessels. He crossed the White Sea, and eventually made the west coast of Nova Zembla; proceeding thence northwards, naming several headlands and islands. They encountered an immense field of ice, of which they could see no end from the mast-head, and they had to turn back. After becoming entangled in drift-ice, and experiencing misty, cold and tempestuous weather, the crew began to


De eylande van Orange
C. de troost
Het behouden Huys
Heemskerck hoeck
C. de Naſsow
Cruys Eylandt
Willems Eylandt
Beerefoort
Den Swarten hoeck
D'Admiraliteyts Eylandt
NOVA ZEMBLA
C. Plantio
Loms bay
Lange nes
D'eerſte hoeck
Cants hoeck
Swarte klip
Coſtint Sarch
Cruys hoeck
Schans hoeck
S Laurens bay
Meel haven
Laech Eylandt
Het laeghe landt
Twe Eylanden
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State Eylandt
Tartariæ Pars
Oby fl.
De ton hack
Valcken hoeck
Colgoy
Toxar
Candenos
RUSSIAE PARS

NOVA ZEMBLA—THE WONDERFUL VOYAGE OF BARENTZ.

murmur, and then refused positively to proceed. Again, in May, 1596, Barentz sailed from Amsterdam, and arrived home in the following year, after a voyage of many hardships and trials.

Subsequently numerous attempts were made to reach the Pole, all of which were fruitless, some being attended with disaster. At length, in the year 1818, two vessels were fitted out by the British government to proceed toward the North Pole. Captain Sir John Ross and Lieutenant Parry were appointed commanders. No former expedition had been fitted out on so extensive a scale, or so completely equipped in every respect as this one. The circumstance which stimulated the sending out of these vessels was the open character of the bays and seas in those regions, very large quantities of the polar ice having floated down into the Atlantic for the previous three years. This expedition had instructions to discover the north-west passage. Another, under Captain Beechey and Lieutenant Franklin, afterward Sir John Franklin, was to penetrate to the North Pole. The objects of the latter expedition were entirely scientific. It passed north between Greenland and Spitzbergen, but did not go much further. Captain Ross sailed about sixty miles up Lancaster Sound, and returned with the report that it was a bay, through which there was no outlet to the ocean beyond. From York Factory an overland expedition under Lieutenant Franklin was sent out with instructions to explore the north coast of America, from the mouth of the Coppermine River eastward. He proceeded five hundred and fifty miles east of the Coppermine to Point Turn-again, and then, having suffered great hardships, returned to York Factory without accomplishing the object.

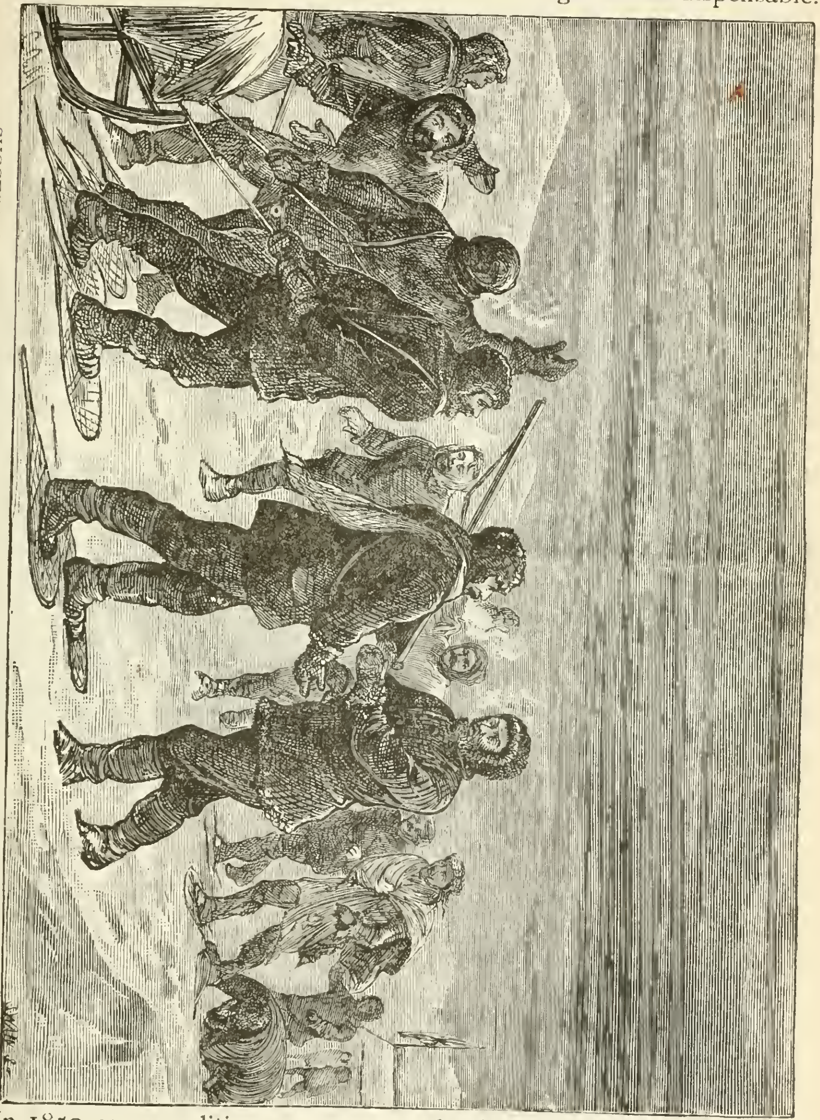
A BAND OF HEROES.

Franklin, in descending the Coppermine River, was accompanied by a set of officers and men as heroic as ever trod a deck; among the former were Dr. Richardson, Lieutenant Back and Lieutenant Hood, and among the latter a faithful seaman named Hepburn. The Coppermine River had never been thoroughly explored, and the enterprise was one of great danger. Ascending the Hayes River on their inland route to the Coppermine, they accomplished seven hundred miles of river journey, over rapids and falls and obstacles and difficulties innumerable, from which ordinary men would have turned back.

The setting in of the ice compelled them to relinquish their labors in that direction for the present. Franklin, however, was not idle—it was not in the nature of the man to be so—and therefore he, Back and Hepburn started off in January westward, working up eight hundred and fifty miles, until in March they reached Fort Chipewyan, where many important observations were made. In July he was joined by Richardson and Hood, and hoped to winter that year at the mouth of the Coppermine. A large party was made up, consisting of Franklin and his friends, seventeen French-Canadian travelers, three interpreters, and a considerable number of Indians who were to act as guides and hunters under the leadership of one Akaitcho. The start was all that could be desired, game plentiful, and everything promised well. But as they advanced to the north a change came over the spirit of their dream; food grew scarce, the difficulty of transit increased, and at last Akaitcho declared that to advance further meant for the whole party to perish miserably. Franklin persisted, however, and would have braved all the prophesied risks, till Akaitcho said: "I will send some of my young men with you if you persist in going forward, but from the moment they set foot in your canoes I and my relatives shall mourn for them as dead." Discretion being the better part of valor, Franklin reluctantly determined to settle in winter quaters and continue the exploration in the summer. The place chosen for wintering was at Fort Enterprise, near the head of the Coppermine.

During the winter food grew scarcer and scarcer, until at last starvation was threatened. In addition to their own party, the Indians had to be provided for, and this greatly impoverished their resources. The Indians knew this, and, with a generosity which Christian men might sometimes imitate, gave their own food to the strangers who seemed more to need it. "We are used to starvation, you are not;" they said. By-and-by a time came when the situation was gloomy in the extreme; ammunition, and other articles indispensable to the progress of the expedition, and food were fast failing. What was to be done? There was only one course open, and that was to journey on foot a distance of over five hundred miles to Fort Chipewyan, in the depth of an Arctic winter, for supplies. A volunteer was soon found. Lieutenant Back was not a man to allow his comrades to perish while he had strength and vigor to save them, and he undertook to perform the journey and obtain the needful supplies. Day after day he and his companions toiled on over ice and snow, and night after night braved the inclemency of the weather by camping out of doors. With snowshoes galling their feet and ankles till they bled profusely; with only sufficient food to keep them from starving, and, therefore, rendering them all the more susceptible to cold; with weather unusual in the severe region for its severity, on they went, until at last they reached the station, procured four sledges, laden to the full with needful things, and the promise of more to follow, and then, after a brief rest, set off again for Fort Enterprise.

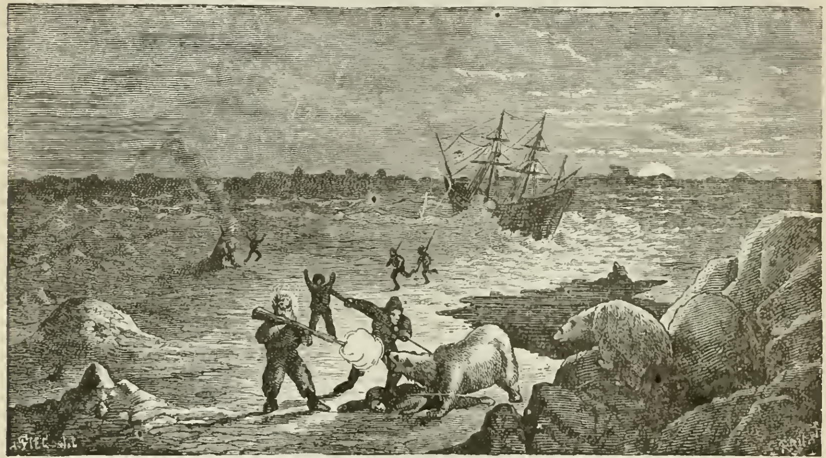
During the journey Back traveled eleven hundred and four miles, and when he rejoined his companions it was to find that his unprecedented journey was a success in every respect, for they had arrived at a stage in their experience when the aid he brought was indispensable.



SUCCESS OF THE WONDERFUL JOURNEY OF A THOUSAND MILES FOR FOOD.

In 1850 an expedition was sent out by Mr. Henry Grinnell, a merchant of New York, in search of Sir John Franklin and his companions. Mr. Grinnell's expedition consisted of only two small brigs, the "Advance" of one hundred and forty tons, the "Rescue" of only ninety tons. The command was given to Lieutenant E. De Haven, a young naval officer, who accompanied the United States exploring expedition. Doctor E. K. Kane, surgeon and naturalist, was one of the officers. The expedition was absent a little more than sixteen months. Off the coast of Labrador they met an iceberg making its way toward the tropics. The night was very dark, and as the huge voyager had no "light out," the "Advance" could not be censured for running foul. She was punished, however, by the loss of her jib-boom, as she ran against the iceberg.

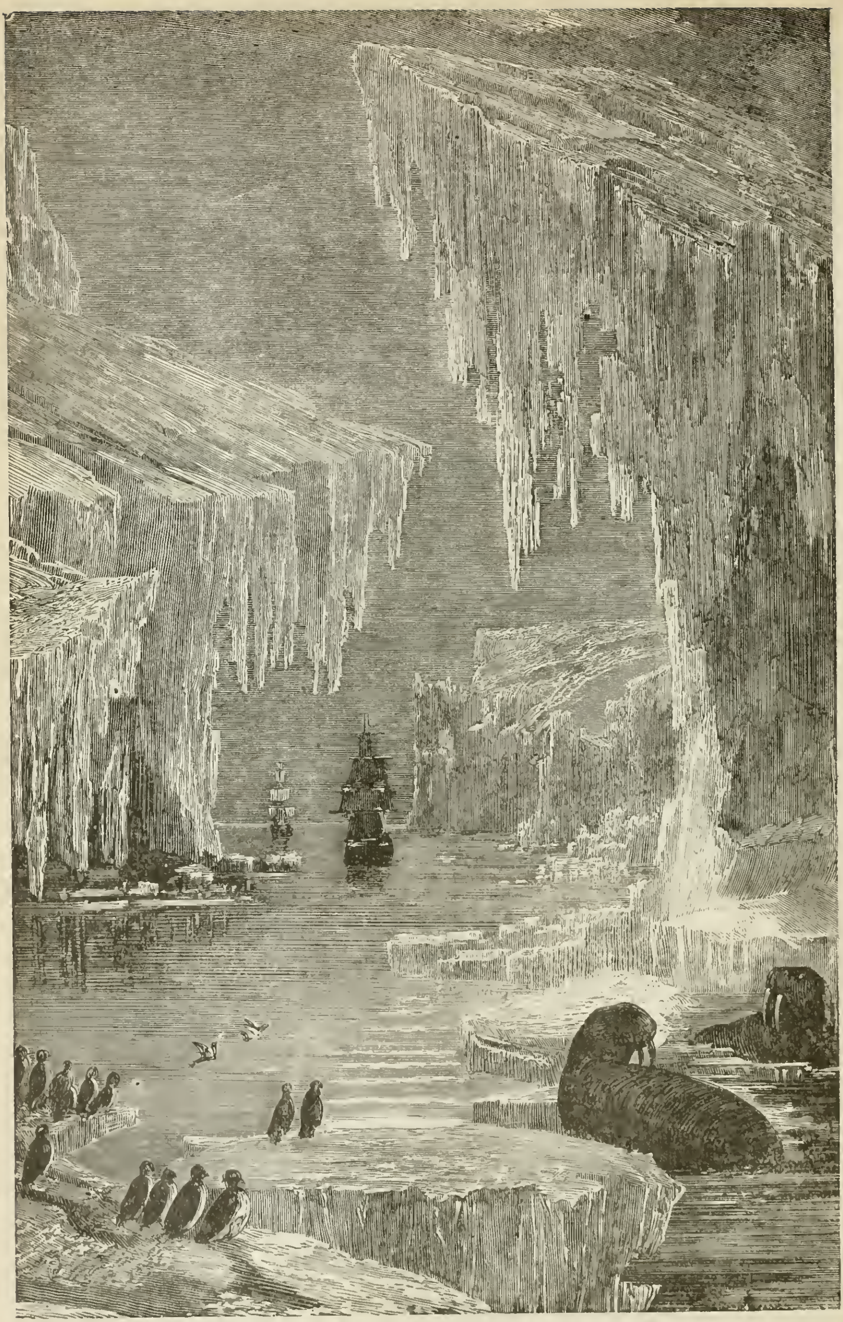
When the expedition reached Melville Bay, which, on account of its fearful character, is also called the Devil's Nip, the voyagers began to witness more of the grandeur and perils of Arctic scenes. Icebergs of all dimensions came bearing down from the polar seas. They also encountered immense floes, with only narrow channels between, and at times their situation was exceedingly perilous. On one occasion, after heaving through fields of ice for five consecutive weeks, two immense floes, between which they were making their way, gradually approached each other, and for several hours they expected their vessels would be crushed. An immense cake of ice, six or eight feet thick, slid under the "Rescue," lifting her almost "high and dry," and careening her partially upon her beam ends. By means of ice anchors (large iron hooks) they kept her from capsizing. In this position they remained about sixty hours, when, with saws and axes, they succeeded in relieving her. The ice now opened a little, and they finally warped through into clear water. While they were thus confined, polar bears came around them in abundance, greedy for prey, and the seamen indulged a little in the perilous sports of the chase.



A DANGEROUS ADVENTURE WITH POLAR BEARS.

The navigators explored the coast at and near Cape Riley, and there found in a cove on the shore of Beechey Island, or Beechey Cape, on the east side of the entrance to Wellington Channel, unmistakable evidence that Sir John Franklin and his companions were there in April, 1846. There they discovered many articles known to belong to the British Navy, and some that were the property of the "Erebus" and "Terror," the ships under the command of Sir John. There lay, bleached to the whiteness of the surrounding snow, a piece of canvas, with the name of the "Terror" marked upon it with indestructible charcoal. It was very faint, yet perfectly legible. Near it was a guide-board lying flat upon its face, having been prostrated by the wind. It had evidently been used to direct exploring parties to the vessels, or, rather, to the encampment on shore. The board was pine, thirteen inches in length, and six and a half in breadth, and nailed to a boarding pike eight feet in length. It is supposed that the sudden opening of the ice caused Sir John to depart hastily, and in so doing this pike and its board were left behind. They also found a large number of tin canisters, such as are used for packing meats for a sea-voyage; an anvil block; remnants of clothing, which evinced by numerous patches and their threadbare character that they had been worn as long as the owners could keep them on; the remains of an India-rubber glove, lined with wool; some old sacks; a cask, or tub, partly filled with charcoal, and an unfinished rope-mat, which, like other fibrous fabrics, was bleached white. But the most melancholy traces of the navigators were three graves in a little, sheltered cove, each with a board at the head bearing the name of the sleeper below. These inscriptions testify positively when Sir John and his companions were there.

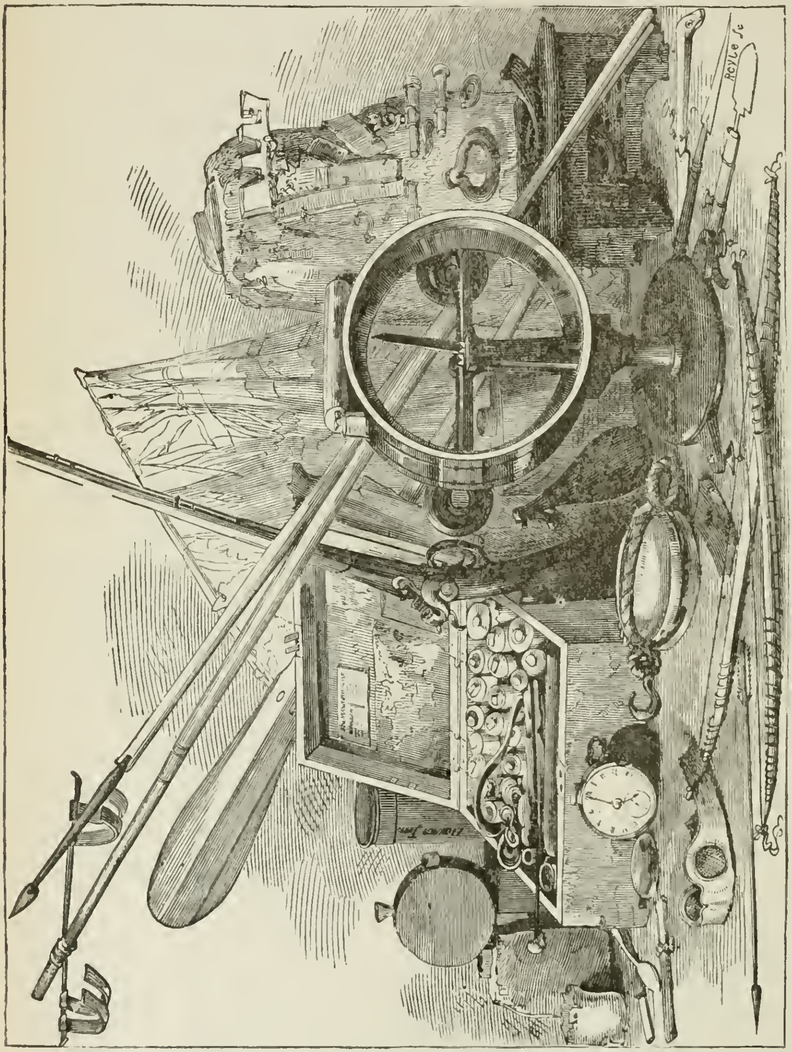
Three expeditions were sent out in 1848 to search for Franklin, and later these were followed by several others, under the patronage of the British government and Lady Franklin. Traces of the Franklin expedition were found in 1850 at Cape Riley and Beechey Island, and articles belonging to Sir John Franklin's officers were seen in possession of the Esquimaux at Selby Bay in 1854 by Dr. Rae, but authentic information concerning the fate of Franklin was only obtained in 1859. An expedition sent out by Lady Franklin under Captain Francis McClintock, passed in 1857 through Baffin's Bay, Lancaster Sound, and Prince Regent Inlet to Bellot Strait, whence sledge expeditions were made to King William Land. Here, in 1859, were found relics of Sir John Franklin's expedition. At Point Victory was found a tin case containing a brief record dated May 28th, 1847, to the effect that the expedition had passed the previous winter at Beechey Island, after ascending the Wellington Channel, and returning by the west side of



A WONDERFUL PASSAGE BY FRANKLIN'S SHIPS.

Cornwallis Island. All the party were then well. On the margin was another record, dated April, 1848, to the effect that one hundred and five men under Captain Crosier had abandoned the two vessels, that Sir John Franklin had died June 11th, 1847, and that the total deaths were nine officers and fifteen men. Quantities of clothing were found, but no trace of the vessels. It was evident that the whole expedition had perished. It seems that Sir John Franklin passed up Lancaster Sound, explored Wellington Channel to a point further north than was reached by those who were sent out to search for his party, and wintered on Beechey Island. In the spring and summer of 1846 he either navigated Bellot Strait, or more probably pushed through Peel Sound, and finally reached Victoria Strait, and thus supplied the only link wanting to complete a chain of water communication between the two oceans. Thus Sir John Franklin is the discoverer of the North-western Passage.

Doctor E. K. Kane conducted the second Grinnell expedition, George Peabody, of London, and others uniting with Mr. Grinnell in bearing the expense. Doctor Kane received his orders from the Navy Department at Washington to conduct an expedition into the Arctic regions in search of the great English navigator. The ship "Advance," in which he had formerly sailed, was placed under his command. His party numbered seventeen picked men. The brig sailed from the port of New York in May, 1853, and in eighteen days arrived at St. John's, Newfoundland. After providing themselves at this place with an additional stock of fresh meat, and a valuable team of Esquimau dogs, they steered for the coast of Greenland. From his researches in this region, Doctor Kane came to the conclusion that this coast of Greenland faced to the north. After sixteen miles of foot journey the company reached a great headland, to which they give the name of Thackeray. Eight miles further on a similar eminence attracted their attention, to which they applied the epithet of Hawkes. The tablelands here were twelve hundred feet high. The party continued their difficult and dangerous journey until they reached some lofty headlands, where they determined to terminate their excursion. These had an altitude of eleven hundred feet, and overlooked an expanse extending beyond the eightieth parallel of latitude. The view from this elevation was marked by every element of gloomy and cheerless magnificence. Winter was now rapidly approaching, and it was necessary to select some appropriate spot in which the crew and the vessel might pass its long, gloomy and dangerous interval. For various reasons, Doctor Kane resolved to remain where he then was. He had arrived at the conclusion that Rensselaer Harbor would be the most desirable winter-quarters, and on the 10th of September they commenced the labors necessary to render their position tenable and safe. They removed the contents of the hold of the vessel to a store-house which they prepared on Butter Island. A deck-house was built on the vessel, in which the different qualities of ventilation, warmth, dryness, room and comfort



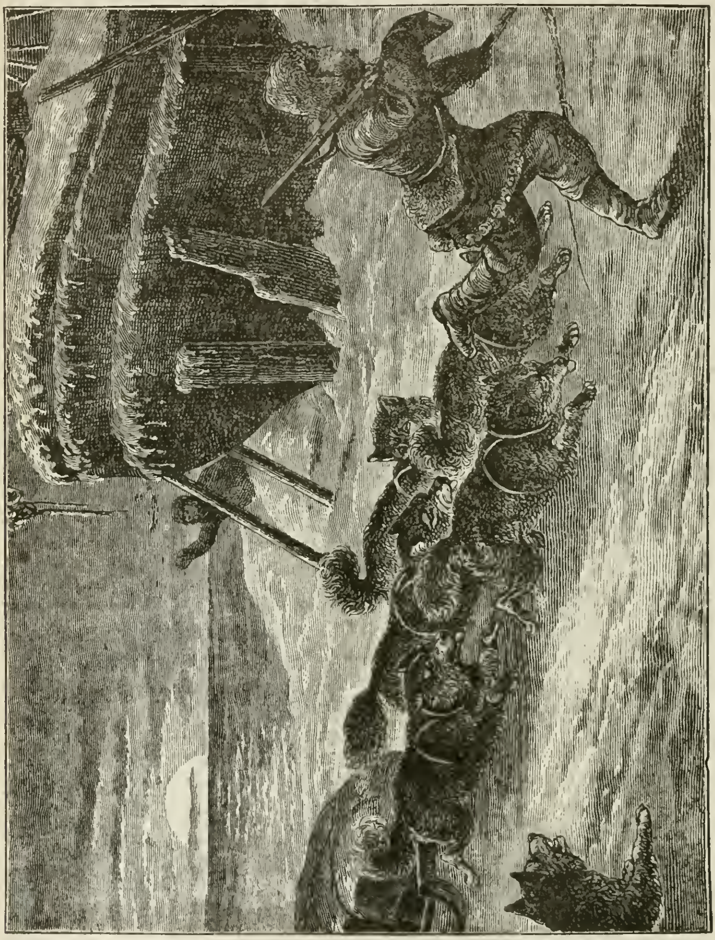
MARVELOUS RELICS OF FRANKLIN'S EXPEDITION.

were sought to the utmost possible extent. A site for the observatory was selected. Stones were hauled over the ice on sledges for its erection. Its location was on a rocky inlet about a hundred yards from the vessel, which they named Fern Rock. Preparations were also made preparatory to the work of establishing provision depots on the coast of Greenland. The advantage of these provision depots will appear from the fact that by their assistance expeditions of search could afterward be conducted with the use of sledges and dogs. The provisions for the latter, if taken on the journeys themselves, form so heavy a load as seriously to embarrass the movements of the travelers. But when they were released from this labor these dogs conveyed the sledges and their occupants on long journeys successfully, and with great rapidity, on their tours of examination.

In September the first party organized to establish provision depots was sent out. It consisted of seven men. A sledge thirteen feet in length, called the Faith, was filled with pemmican, and was drawn by those attached to it by means of track-ropes, termed rue-raddies, which were passed around the shoulder and under the arms. The intended location of this depot was sixty miles from the brig, on the Greenland coast. The life of the party which remained in the vessel was not devoid of incident and interest. By the tenth of October the party which had been sent to establish the first depot of provisions had been absent twenty days, and their return was anxiously expected. Doctor Kane at length determined to start out in search of them. He traveled with one companion on a sledge drawn by four Esquimau dogs. He averaged twenty miles per day with this singular team.

One morning, several hours before sunrise, he perceived on the distant and snowy waste a dark object which seemed to move. It proved to be the returning depot party. They had traveled at the rate of eighteen miles per day, and had been twenty-eight days engaged in their laborious expedition. Some of their limbs had been frozen, and they had met with other mishaps, though none were of a very serious nature, and they had accomplished the purpose for which they had been sent out. The greeting which ensued on their return to the ship was hearty on both sides. They had made the first deposit of provision at Cape Russell. Thirty miles further on they left about a hundred and ten pounds of pemmican and beef, about thirty pounds of a mixture of pemmican and meal, and a bag of bread. They made their third and last deposit on an island called James McGary, after the second officer of the expedition. Here they erected a cairn and buried six hundred and seventy pounds of pemmican and forty of meat, biscuit, with other items, making in all eight hundred pounds.

By the seventh of November the darkness of an Arctic winter began to settle down upon them. It was necessary to keep the lamps lit constantly. In spite of the intense cold, Doctor Kane continued to make his magnetic observations in the observatory. When the thermometer stood at forty-nine degrees below zero, and even at sixty-four degrees below zero, he still effected his astronomical investigations and calculations. On the twenty-first of January, the first traces of the returning light became visible. Its approach was indicated by a beauteous orange tint, which flushed the distant southern horizon. But still the darkness seemed to be external and unvarying. The continued absence of light appeared to affect the health of the party as much as the excessive rigor of the cold. By the twenty-first of February the sun's rays became clearly visible, and, when March arrived, it brought with it the almost perpetual day which alternately takes the place in the Arctic realms of almost perpetual night.



A LIVELY START OF KANE'S SLEDGE EXPEDITION.

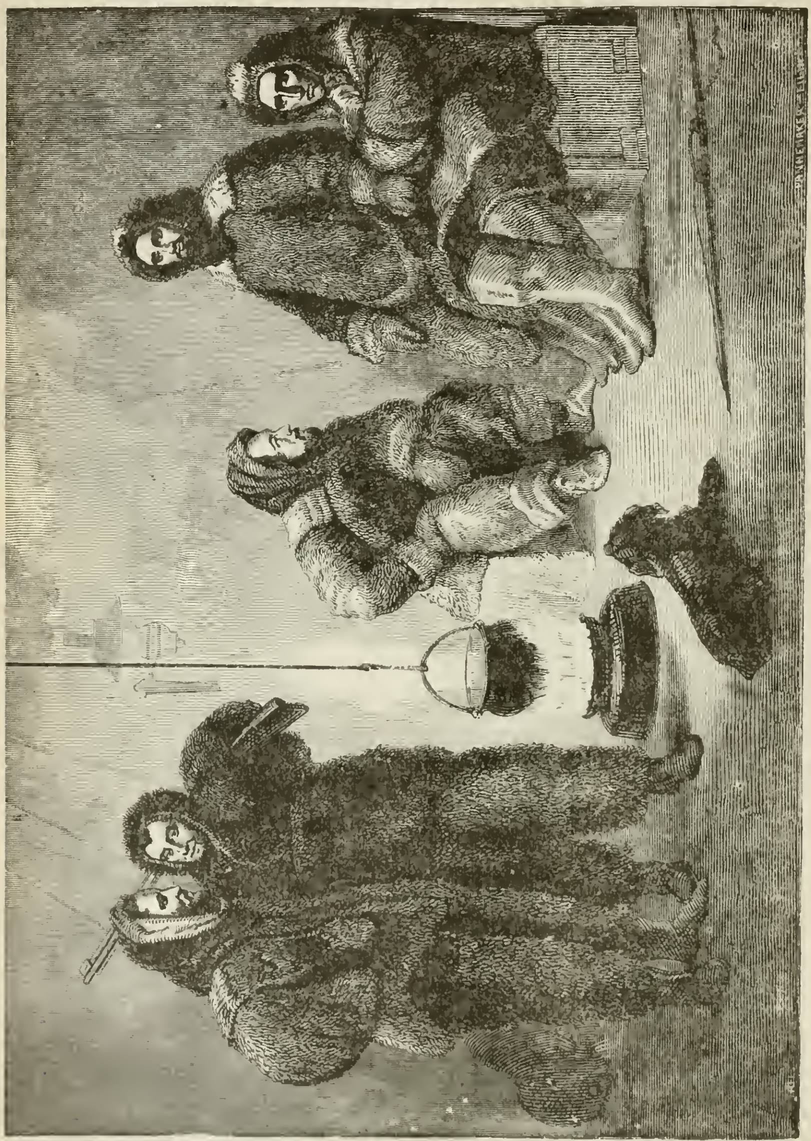
By the middle of March the spring tides began to break and move the massive ice which still bound the Arctic Sea. The ice commenced to grind and crush, the water to dash to and fro, and the vessel to rise and descend in a range of seventeen feet per day. Soon a depot party was sent out preparatory to the commencement of the operations of the summer. The necessary preparations for inland trips and researches were made, sledges and accoutrements were contrived, and moccasins were fabricated. While these labors occupied their attention, a portion of the depot party suddenly reappeared at the vessel. They brought back a terrible report. They had left four of their number lying on the ice frozen and disabled, and they had returned to obtain instant relief.

SNOW THAT BURNS AND DRAWS BLOOD.

Not a moment was to be lost. Ohlsen, the only one of the returned party who seemed able to give any information, was wrapped up in buffalo robes and placed upon a sledge. Nine men started out to the rescue. The cold was intense, ranging seventy-eight degrees below the freezing-point. The instant the party ceased to move they would have been frozen to death. Violent exercise alone kept them alive. When they ventured to apply snow to their lips to slake their thirst, it burnt like caustic, and blood immediately followed. Some of the men were seized with trembling fits and some with attacks of short breath. Doctor Kane himself fainted twice upon the snow under the intense cold.

After a laborious and dangerous journey of twenty-one hours, the lost party were discovered. They were nearly forty miles distant from the brig. Their condition was perilous in the extreme, and the succor did not come a moment too soon. But the rescuers were scarcely better off than the rescued. They were compelled to drag a load of nine hundred pounds upon the sledge, and during their return trip the whole party were in imminent danger of being frozen to death. They could with the utmost difficulty resist the disposition to sleep, which would have immediately sealed their fate. After a fearful journey of several days, the party regained the brig; but the sufferings of that terrible occasion were almost beyond the power of imagination. They had traveled about ninety miles, and most of the men had become temporarily delirious, nearly all were frozen in some portions of their bodies, and two of them ultimately died in consequence of their exposure.

In April, the time having arrived to continue his researches in Arctic discovery, Doctor Kane determined to resume his expedition. He resolved now to follow the ice-belt to the Great Glacier of Humboldt, and thence to stretch along the glacier toward the west of north and make an attempt to cross the ice to the American side of the channel. The object of this bold venture was to attain the utmost limit of the shore of Greenland, to measure the waste which extended between it and the unknown west, and thus to reveal, if possible, some of the mysteries which surrounded the North Pole. The journey was immediately commenced. After many adventures and sufferings, the Great Glacier of Humboldt was reached, named after the renowned German explorer.



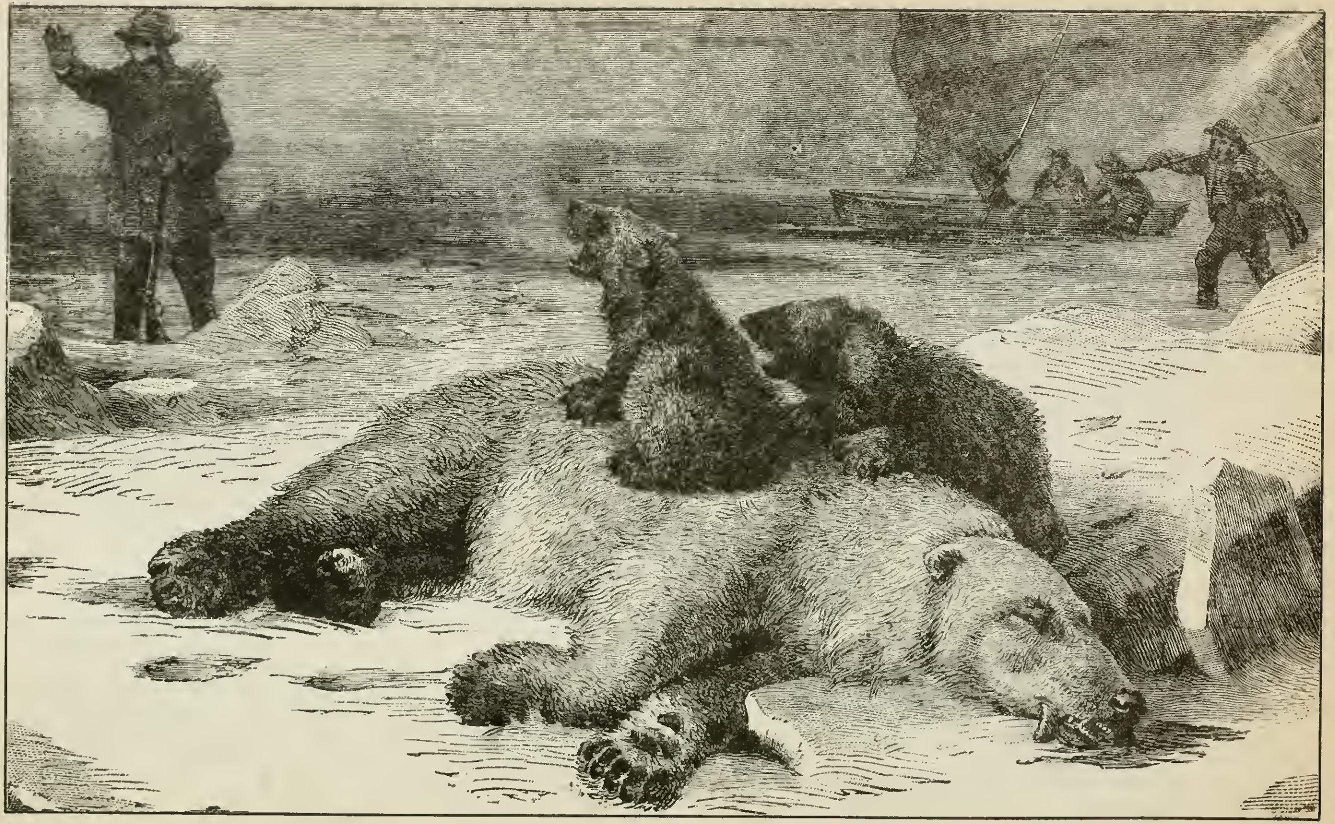
KANE AND HIS COMPANIONS BRAVING THE TERRIBLE COLD.

In the latter part of June one of the two exploring parties returned to the brig. Several of them had become nearly blind. After twelve days' travel they had reached the Great Glacier. They found the depot of provisions, which had been deposited the previous season, destroyed by the bears. An alcohol cask strongly bound in iron was dashed into fragments, and a tin liquor can was mashed and twisted into a ball. This party of explorers had found it impossible to scale the Great Glacier, and returned to the brig without having effected any results of importance. They were obliged to relinquish their fruitless endeavors.

THRILLING ADVENTURES AMONG ICEBERGS.

The other party reached the foot of the Great Glacier. They steered northward, keeping parallel with the glacier, and from five to seven miles distant from it. The thickness of the ice over which they journeyed was found to be seven feet five inches. They traveled frequently with the snow up to their knees. When they had reached Peabody Bay they encountered the bergs, whose surface was fresh and glassy. Some of these were rectangular in shape, and some were square, and their length varied from a quarter of a mile to a mile. The task of traveling over these bergs was full of difficulty and danger. At length they made their way to the ice beyond. From this point the advance of the party was perilous. They were frequently arrested by wide and deep fissures in the ice. Some of these chasms were four feet wide, and contained water at the bottom. From this point they beheld the distant northern shore, termed the "West Land."

At length the party reached a point opposite the termination of the Great Glacier. It appeared to be mixed with earth and rocks. Traveling on they reached the head of Kennedy Channel, and saw beyond the open water. Passing in their route a cape, they called it Cape Andrew Jackson. Here they found good, smooth ice; for during the last few days they had passed over rotten ice, which not unfrequently threatened to break beneath them. Having entered the curve of a bay, they named it after Robert Morris, the great financier of the Revolution. Kennedy Channel here grew narrower, but afterward it widened again. Broken ice in large masses was floating in it: but there were passages fifteen miles in width which remained perfectly clear. Six miles inward from the channel mountains rose to the view. Here they encamped, after having traveled forty-eight miles in a direct line. They could plainly see the opposite shore, which appeared precipitous and surmounted with sugar-loaf-shaped mountains. At this part of their journey they encountered a polar bear with her cubs. A desperate fight ensued, in which the singular instincts of nature were strikingly illustrated by the desperate efforts made by the poor brute to protect her helpless offspring. A shallow bay covered with ice was then crossed.



WONDERFUL BRUTE AFFECTION—KILLED WHILE DEFENDING HER YOUNG.

They passed several islands which lay in the channel, which they named after Sir John Franklin and Captain Crozier. The cliffs which here constituted the shore of the channel were very high, towering at least two thousand feet above its surface. The party attempted to ascend these cliffs, but found it impossible to mount more than a few hundred feet. They here encountered a cape, and the party desired to pass around it in order to ascertain whether there lay any unknown land beyond it. But they found it impossible to advance. This then was the utmost limit and termination of their journey toward the Pole. One of the party ascended an eminence here, and carefully scrutinized the aspects of nature all around him. Six degrees toward the west of north he observed a lofty peak, truncated in its form, and about three thousand feet in height. This elevation is named Mount Edward Parry, after the great pioneer of Arctic adventure, and is the most extreme northern point of land known to exist upon the globe. There was beheld toward the north, from an elevation of four hundred feet, a boundless waste of waters stretching away toward the Pole. Not a particle of ice encumbered its surface. Here was a fluid sea, in the midst of whole continents of ice, and that sea seemed to wash the Pole itself. The eye of the explorer surveyed at least forty miles of uninterrupted water in a northern direction. The point thus reached in this exploring expedition was about five hundred miles distant from the Pole. Had the party been able to convey thither a boat, they might have embarked upon the bright and placid waters of that lonely ocean. But having been able to make this journey only with the sledge, further explorations were of course impossible. The most remarkable development connected with these discoveries was, that the temperature was here found to be much more moderate than it was further south. Marine birds sailed through the heavens. Rippling waves followed each other on the surface of the deep. A few stunted flowers grew over the barren and rocky shore. The inference which may be drawn from these and other facts is, that this open sea, termed the Polar Basin, stretches to the Pole itself, or at least continues a great distance until its course is interrupted by other projections of the earth.

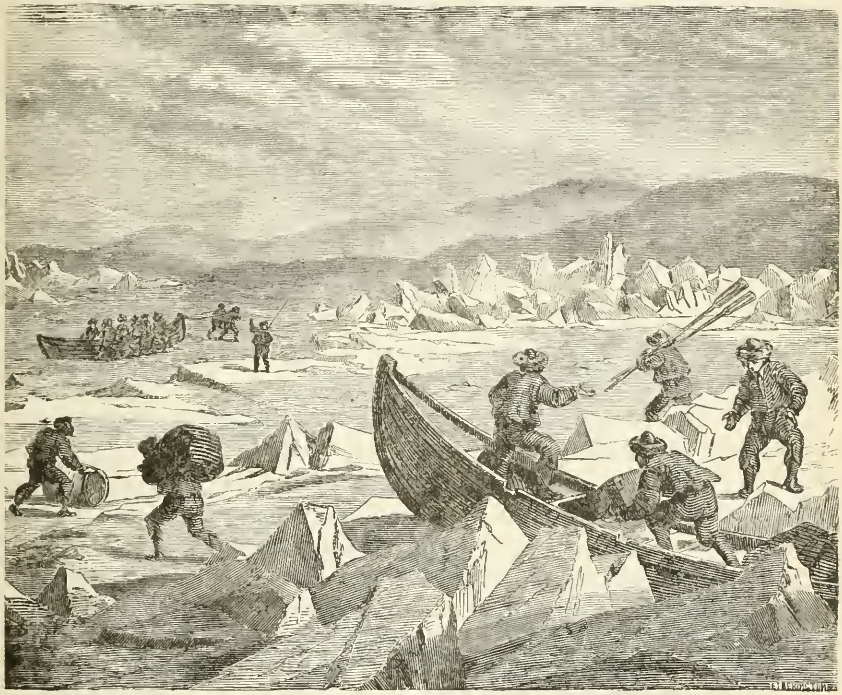
The prospect of a second winter amid the eternal snows and ice of the Polar Circle was not inviting to the adventurers. A portion of them felt convinced of the practicability of an immediate escape to the south. Doctor Kane summoned all hands together and clearly stated to them the aspects of the case. He advised that all should remain by the brig till the next spring, although he declared that those who wished to return could make the attempt. Eight men concluded to remain, and nine of them resolved that, rather than endure the miseries of a second winter near the Pole, they would run the risks of an instant attempt to escape. This resolution they made immediate preparation to execute. A full share of the remaining provisions was measured out to them: they were assured of a welcome reception if they chose to return, and they started forth from the brig. One of this party returned to the vessel in a few days; the rest wandered for many months and endured much misery and exposure before they rejoined their wiser comrades in the brig, thankful to get back.

DOCTOR KANE'S NARROW ESCAPE FROM DROWNING.

Doctor Kane and the eight men who remained with him immediately began to prepare for the horrors of the ensuing winter. They gathered a large amount of moss, with which they lined and padded the quarter-deck. This expedient rendered their cabin impervious to the changes and the extreme severity of the atmosphere. They stripped off the outer-deck planking of the brig for the purpose of firewood. The chief necessity of the explorers was fresh meat, to guard them against the scurvy. To obtain this food, frequent excursions were made for the purpose of capturing seals. On one of these occasions Doctor Kane narrowly escaped a watery grave. He was twelve miles' distance from the brig with a single attendant. The ice broke beneath their sledge and they were precipitated into the water. After great exertions and amid extreme danger they succeeded in regaining ice sufficiently strong to bear their weight. They lost their sledge, tent and guns.

They waited patiently for the time to arrive when they could commence the necessary preparations for the journey of thirteen hundred miles which they would undertake in the spring. The vessel would evidently remain so firmly fixed in an ocean of ice that its removal would be utterly impossible. Their return must be effected with the combined use of sledges and boats.

The means of conveyance which were to carry the company on this long and weary journey homeward, and which were to be carried by them in a great measure, consisted of three boats. These had all suffered very materially from exposure to the ice and the Arctic storms, and were scarcely seaworthy. They were strengthened and tinkered in every possible way by oak bottom pieces and by wash-boards, which protected the gunwales and gave them greater depth. The provisions were stored carefully under the thwarts. The boats were to be drawn by the men with rue-raddies, or straps, which passed over the shoulder. Having made all the preparations which were possible under the circumstances of the case, Doctor Kane announced to his crew their final departure from the brig. Each man was allowed to select and retain eight pounds of personal effects. He was determined to commence this memorable journey on the day appointed, at all hazards. At length the day preceding that of departure arrived. The boats were removed from the brig and placed upon the ice. This process seemed to revive to some degree the desponding spirits of the men. The provisions were then conveyed into them, and other necessary transfers were made. After some hours of active operations, the whole of their task was completed, and the men returned on board the brig in order to spend their last night in that familiar shelter. At length the wished-for moment arrived when the weary adventurers were to take their last farewell of the vessel which had been associated with them in so many vicissitudes and dangers. Thirteen hundred miles of ice and water lay between their present position and the shores of North Greenland.



START FOR THE PERILOUS JOURNEY HOMEWARD.

They continued to toil onward from day to day. Their progress was satisfactory, though their labor was exhausting. Doctor Kane sometimes continued sixteen hours in succession at the post of duty. But now their allowance of food began to grow scanty. It was reduced to six ounces of bread-dust per day, and a lump of tallow about the size of a walnut. An occasional cup of tea was their only consolation. From this stage in their journey Dalrymple Rock became perceptible in the distance. But the physical strength of the men began to give way beneath their labors and their insufficient diet. At this crisis a gale struck them from the north-west, and a floe, one end of which having grounded on a tongue of ice about a mile to the northward of them, began to swing round toward the boats, and threaten to inclose and crush them. Soon the destruction of the surrounding ice threatened their own. For hundreds of yards on every side around them the ice was crumbled, crushed, and piled in irregular and fragmentary masses. The thunder of the confused ocean of frozen wrecks was overpowering. Suddenly the ice seemed to separate and form a channel; and in that channel, so unexpectedly opened before them, the men rowed the boats with the aid of their boat hooks, and escaped a danger which a moment before seemed inevitable and ruinous.

Finally they came within sight of the Devil's Thumb, and were no longer wanderers in unknown regions; but were within the limits of the district frequented by the whalers. Soon they reached the Duck Islands. At length they passed Cape Shackleton, and then steered for the shore of Greenland. They rowed on. Soon Kasarsoak, the snow-capped summit of Sanderson's Hope, appeared to them, towering above the mists; and as they approached the welcome harbor of Upernavik, from which they had issued several years before in the gallant vessel they had now left behind them, they felt as only such men under such circumstances could feel. During eighty-four days they had lived in the open air, tossing in frail boats on the bosom of the angry, half-frozen deep. They were delivered from a thousand deaths, and arrived at last safely at Upernavik, where they were received with hospitality.

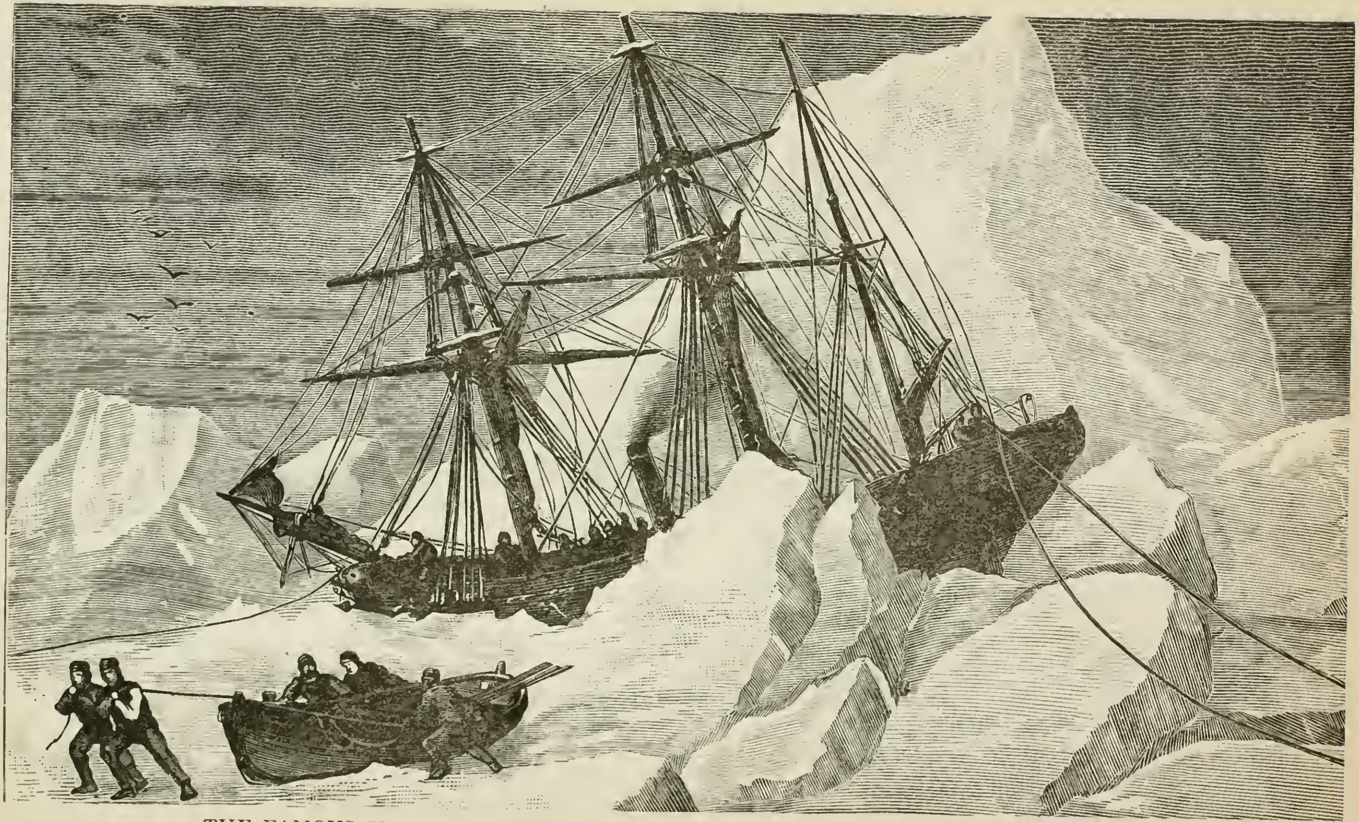
The results of his expedition comprise the survey and delineation of the north coast of Greenland to its termination by a great glacier; the survey of this glacier and its extension northward into the new land named Washington; the discovery and delineation of a large tract of land, forming the extension northward of the American continent, and a survey of the American coast, all results of great value.

THE WONDERFUL FROZEN SEA.

Whatever opinions may be entertained as to the existence of an open sea around the North Pole, it is agreed on all hands that there is a Polar Frozen Sea. In both the northern and southern high latitudes it has been found that there is a certain limit beyond which the progress of ships is barred by an impenetrable fence of ice. What is beyond it is more or less matter of speculation. Concerning the Frozen Sea of the Arctic regions, much more is known than has been ascertained about the Frozen Sea in the Antarctic Circle; many more expeditions have been sent out to examine the nature of the sea around the North Pole than have ventured to the South; but it would appear that the latter is, of the two, the more impervious. Ocean surveyors, from the time of Cook to the time of Ross and Penny, have been unanimous in reporting that there is no indication of a break anywhere along the southern barrier. Their ships sailed for many degrees along the outer face of an icy wall, of which the first shelf was as high as their mainyard. Above and beyond that shelf, as far as the assisted sight could reach, there was nothing but solid ice, save in some few places, where what looked like land was joined on to and backed the frozen fringe. Mile after mile, day after day, the ships sailed on coastwise, keeping a pretty straight line of latitude, watching narrowly for an opening in the hard ice cliff. Not an opening presented itself, and the results of discovery in the Antarctic regions have been to show that land, probably in large proportions, does exist beyond the ice.

SWEPT ONWARD A THOUSAND MILES.

The frozen condition of the Arctic Ocean is a fact within the experience of every whaler, though the question of the extent to which the sea is frozen remains unsettled. At a degree of latitude which varies with the season of the year, the progress of ships northward is barred by a barrier of frozen water. During the summer months, when occasionally the thermometer will register a heat equal to the mean temperature of the tropics, and such life as there is in the Arctic Circle wakes up and renews its lease, the zone of the north is loosened, the outer edge of the belt cracks and splits into vast mountains of ice which, becoming detached, get under way and start for the south. From the end of May they are to be met with in the North Atlantic, sailing majestically and dangerously towards those warmer regions of which the temperature is reduced and invigorated by their icy presence. The question is whether there is any general break up of the Frozen Sea, whether in the more northerly parts the pack ice ever becomes loose ice, and again whether, supposing it does not become loose, the pack ice drifts bodily southward as it has been suggested it does. Ships that have been nipped by the ice and have been surprised by winter in the north, report that during their captivity they have been carried many degrees to the southward by the drift of the pack in which they were inclosed. Lieutenant De Haven, of the American navy, when in command of the United States expedition after Sir John Franklin, was frozen up for nine months, at the beginning of which time he was in mid-channel in Wellington Straits, and at the end he found himself one thousand miles to the southward. Her Majesty's ship "Resolute," which



THE FAMOUS SHIP "RESOLUTE," ABANDONED AND AFTER YEARS RECOVERED was abandoned by Captain Kellet in the ice, remained in the cold embrace of the ice nip for several years, but in the end was borne south till the temperature burst her bonds and she was recaptured and sent home unharmed. These instances only prove that the particular portion of the Frozen Sea in which the ships were bound became loose, though there is good reason to think that the entire belt of ice about the North Pole does in ordinarily warm summers become detached, new ice being formed on the extreme northerly limit of the sea as soon as winter returns, in order to replace that pushed away in summer.

THE OPEN SEA AROUND THE POLE.

If we may credit the great amount of evidence which has been adduced, we should adopt the general belief of Arctic explorers, that beyond the Frozen Sea there is a large open sea, free from ice, which extends for several degrees all round the Pole. Dr. Kane crossed a barrier of ice a hundred miles broad, of which the northern boundary was reached in the eighty-third degree of north latitude. There, as already mentioned, he found an open sea extending in an unbroken sheet of water as far as the eye could reach towards the Pole, the waves broke upon the shore, and there was a tidal variation in the height of the water, the temperature of which was four degrees above freezing. Whether this sea was only temporarily free from ice or whether it is always open, is a question yet to be solved. Explorers who have penetrated far to the northward of Doctor Kane's position have reported the whole place ice-bound, with apparently an unmoving, fast-anchored ice-pack stretching away to the north.

There is one huge animal in the Arctic Seas that draws numbers of ships thither in search of him. There are several kinds of whales, and some are found in the southern as well as in the northern seas. But the most remarkable is the Greenland whale, which lives up in the cold and ice of the Frozen Zone. His body is of value because of the quantity of oil which can be obtained from it. And though the whale-fishery is a most dangerous undertaking, many persons are found willing to engage in it. The whale lives in the sea, and to all appearance has the habits of a fish. He has warm blood and breathes the air. He can keep under water for an hour at a time, or even two hours; but this is not his usual practice. Every ten minutes, or quarter of an hour, he comes up to breathe. He has a reservoir of blood which has had its share of oxygen, and is kept ready for use. This reservoir consists of a number of arteries, or vessels, which contain the blood that has been mixed with oxygen. They spread over the inside of the chest, and also of the ribs and the spine. They are found even within the skull. When the whale is a long time under water, and cannot get any oxygen from the atmosphere, he falls back on this store within. The blood can thus continue its course without becoming exhausted. When he does rise to the surface, which he is obliged to do at last, then the whole of the blood receives a supply. Part goes its way through the body, and the rest is received into the reservoir to be ready for use. The tube called the windpipe is not placed as our windpipe is. It does not open into the mouth, but at the top of the head. There is a lump where it opens, and the whale can keep his whole body under water except just this lump. And there is a kind of valve or stopper to the opening of the windpipe which exactly fits it, and can keep out the water, and also resist the greatest pressure. Indeed, the more pressure there is upon it, the tighter it fits. The whale begins to breathe before he quite reaches the surface of the water. The air rushing from the windpipe, and the water together, then the whale is said to "spout."

WONDERFUL CONSTRUCTION AND HABITS OF THE WHALE.

When the whale is struck by the harpoon, he is in a great hurry and fright. He dives down to the bottom of the sea with the utmost speed, and even strikes the ground with his head. Indeed, it is no uncommon thing for him to fracture his skull. He lives among the ice and cold of the north, and is quite protected from the cold by his skin. This skin is really a thick layer of fat, which the sailors call blubber. It has a dark, motley color to look at, and is full of fibres, as our skin is. The whole skin is full of oil, and this is the true riches of the whale, and the reason why he is hunted. As far as the whale himself is concerned, the oily skin is useful for two reasons. It is very warm, and keeps up the heat of the body. And the oil, being lighter than the water, helps him to swim. The whale, large as he is, does not feed on creatures of any size. His throat is so narrow that a herring could not get down it. He lives on jelly-fishes and minute animals. He has no teeth, and is a very harmless creature, in spite of his size. His mouth is the most curious part of him. From the upper jaw there are a number of plates of a horny substance. They stand side by side, and the edges have a fringe of hair. The middle plate is the largest, and the plates keep getting smaller on each side, the last being the smallest. The lower jaw has no plates; but it is in the shape of a great spoon, so that the plates can go into it when the mouth is shut. Now, when the great mouthful of water is taken in by the whale, it runs out again through the plates. But the fringes of hair keep in the tiny, living creatures which are to serve as food. They are, in fact, a kind of filter, for they reject the bad, and only receive the good. The plates are the true whalebone, and as valuable in their way as the oil is in its way.

Whaling vessels set out in the spring, as the summer is the only season when there is a chance of sailing in the Arctic seas. When they reach the spot where whales are likely to be found, a man keeps on the watch, to spy one out. The moment he sees one he calls out, "There she spouts!" Then the boats are let down in pursuit. This is done directly, for the boats are kept ready to start. The harpoon is made of iron, and is a little in the shape of an anchor, but with a sharp point to it. Very swiftly, and without making any noise, the boat glides along, and when the harpoon strikes, the whale dives into the very depths of the ocean. As soon as he appears the boats are ready with fresh harpoons and lances. He will dive again, but this time he cannot stay under water so long. He gets exhausted by repeated wounds, and after a great many struggles he dies. The vast body of the whale is brought near the vessel, and the men get upon it. They have iron spikes in their shoes, or else they could not help slipping. When the whalebone has been taken out of the mouth, the huge mass is turned adrift.

If the whale knew his own power, he would easily destroy all the machinery which the art of man could devise for catching him; it would be only necessary for him to swim on the surface in a straight line, in order to break the thickest rope, but, instead, on being struck by the harpoon, he obeys a natural instinct, which, in this instance, betrays him to his death. Sir Humphrey Davy observes that the whale, not having an air-bladder, can sink to the lowest depths of the ocean, and mistaking the harpoon for the teeth of a sword-fish or a shark, he instantly descends, this being his manner of freeing himself from these enemies, who cannot bear the pressure of a deep ocean; and from ascending and descending in small space, he thus puts himself in the power of the whaler. If we include the pressure of the atmosphere, a body at the depth of one hundred feet would sustain that of sixty pounds on the square inch; while one at four thousand feet, a depth by no means considerable, would be exposed to a pressure of one thousand eight hundred and thirty pounds. We need not, therefore, feel surprised that on the foundering of a ship at sea, though its timbers part, not a spar floats to the surface; for if the hull has sunk to a great depth, all that is porous is penetrated with water, or is greatly compressed. One navigator states that when by entangling the line of the harpoon, a boat was carried down with the whale, it required after it was recovered, two boats to keep it at the surface. As soon as the whale dives after having been wounded, it draws out the line or cord of the harpoon, which is coiled up in the boat, with very considerable velocity. In order, therefore, to prevent any accident from the violence of this motion, which might set the side of the boat on fire, one man is stationed with an axe to cut the rope asunder if it should become entangled, while another, furnished with a mop, is constantly cooling with water the channel through which it passes, as the monster plunges into the depths.

It was on a whaling vessel, the "Arctic," that our American adventurer, Captain Hall, returned to Dundee, after his celebrated expedition in the Polar region, where he met with many losses and misfortunes.

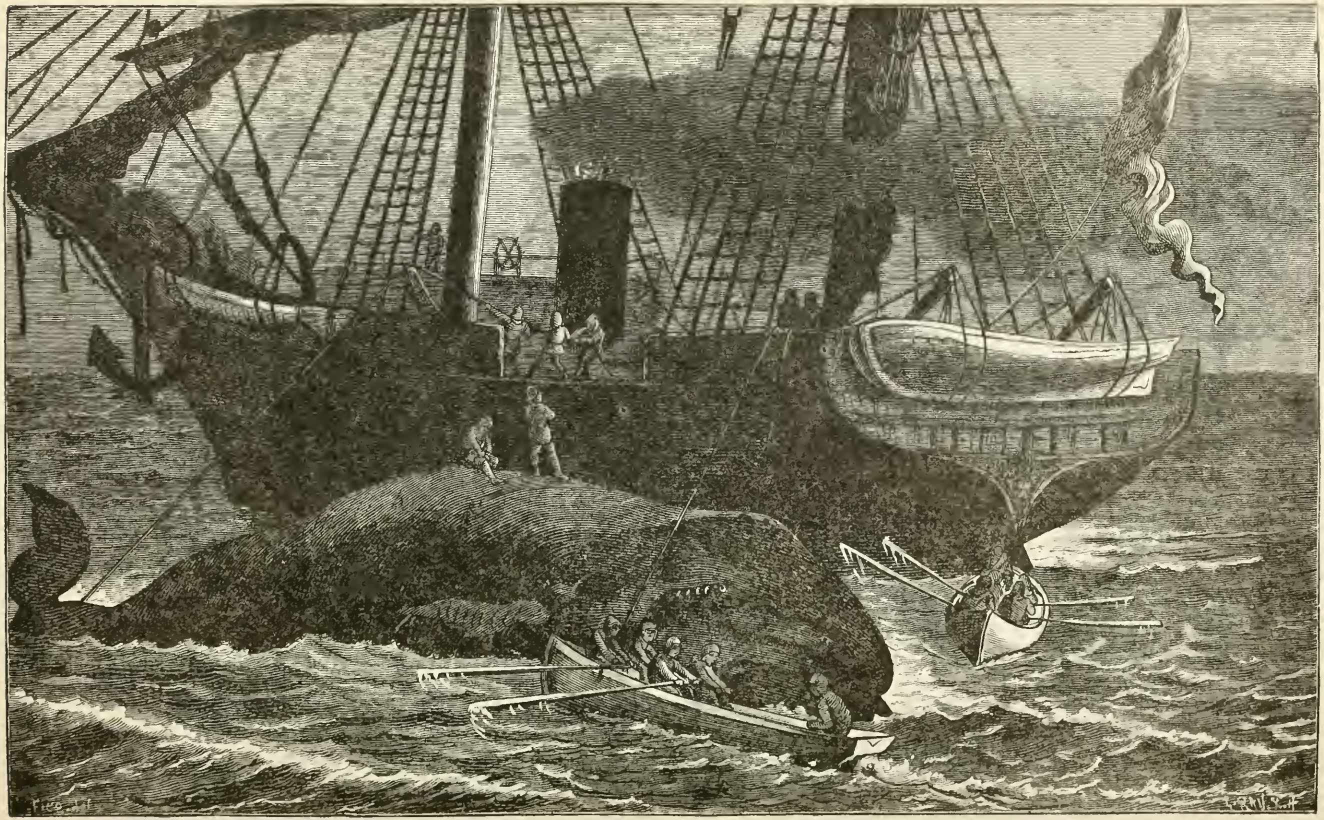
AN AUSTRIAN HERO AND HIS ADVENTURES.

As Austria had been prevented from taking any active part in the great geographical problems of the times, an interest in polar researches gradually developed into a determination to send her flag upon the peaceful quest of new discoveries in the frozen north. Lieutenant Payer, having been previously employed in the survey of the peaks and glaciers of the Alps, was prepared to enter upon a life of active service in the snows and hummocks of Nova Zembla, and was duly commissioned. The ship chosen for the voyage was the "Tegetthoff." It was fitted with provisions and fuel for two years and a half, and sailed in June, 1872. The objects of the expedition were mainly scientific.

After a stop of some days on the Norway coast and the Loffodon Islands, the "Tegetthoff" was at last fairly on her way to her long abode among the icebergs of Nova Zembla. The vessel soon came upon scenes strange and unfamiliar to most of the crew on board. As they came into the region of ice the temperature rapidly lowered. Fogs arose in the distance from the leads in the ice-field, and snowstorms alternated with cloudless skies and genial sun. Far to the north was observed the "ice-blink"—a shining band of light in the horizon —always a faithful monitor of solid ice, of whose radiating power it is a portrayal. There is said to be no more solemn sound than that made by the action upon the ice of the elements of thaw and frost, and no pictures more sad and ghostly than the procession of icebergs floating like huge white biers toward the south. Great falls of thaw-water flowed down the sides of the icebergs, sometimes rending them with a noise as of thunder by their constant wearing and frightful grinding.

MOUNTAINS OF SPLENDID CRYSTALS.

But when the sun came out the fogs disappeared toward the horizon, and the whole scene was bathed in rosy and golden splendor, the ice-crystals flashing like diamonds in the flood of light. Occasionally a whale would rise out of the water like a great black mountain, and then diving deep beneath the surface make the ocean tumultuous with his awkward gambols. The icebergs presented some curious shapes. Some were chiseled as if by a trained sculptor into fantastic forms of Gothic architecture, with quaint little peaks and towers, and grotesque gables. Others represented mammoth structures supported by regular columns, apparently of solid glass. Rarely were the regular prisms, so



THE STEAMSHIP "ARCTIC" CAPTURING AN IMMENSE WHALE.

common in the North Atlantic, observed in these Arctic Seas. Such were some of the sights which greeted our voyagers as they entered the Polar Ocean. They were in a world of frozen wonders.

At length the expedition encountered immense masses of ice. The long night and its fearful cold were before them, and they were drifting they knew not whither. Daily, for one hundred and thirty days, they were destined to experience those terrible oncomings of the ice. They kept everything in readiness for retreat from the ship in case the worse came to the worst. Their sledges were loaded, their boats were manned, and their clothing and provisions were distributed. They slept in their wet, frozen garments, expecting to be called up at any time and driven forth on the ice. But whither should they go? The sea about them was lifting and grinding far beyond the view. Great hummocks danced and whirled, overturning at times with tremendous force, while chasms opened on every hand, threatening to swallow up any sledge, or boat, or person, venturing on the uncertain surface. It was fortunate that these first encounters with the ice occurred while it was yet light. Had these assaults surprised them amid the polar darkness, confusion and disorder would have taken the place of the calm preparations they were now able to make.

The pressure meanwhile continuing, it was thought best to make some kind of a habitation upon a firmer floe, to which they might betake themselves in an emergency. Armed and provided with lanterns they removed two boats, one hundred and fifty logs of wood, fifty planks, and a supply of coal, to the port side of the vessel, and there built their house of refuge. But even this hope might fail them. A storm might carry away the planks which formed its roof, fire might consume the combustible substance of its walls, and at any time a fissure might open from beneath and swallow up the whole community.

The winter of 1872–73 slowly crept away, and the sun, by its reappearance, gave promise of summer. Summer came, but the months of May and June, in temperate climates the glad harbingers of growth and life, brought no relief to the waiting travelers. "Nothing but ice" was the oft-repeated answer of those who eagerly scanned the horizon in every direction. The second summer of the voyage had come and nearly gone. It had begun with promise of liberation, but the time of greatest heat had gone by, and no sign of the predicted release had come. The idea of discoveries had utterly passed out of the minds of the explorers, and yet discoveries beyond their utmost expectations were awaiting them.

August thirtieth brought them a joyous surprise. At mid-day, says Payer, as we were leaning on the bulwarks of the ship, and scanning the gliding mists, through which the rays of the sun broke ever and anon, a wall of mist, lifting itself up suddenly, revealed to us afar off in the north-west the outlines of bold rocks, which in a few minutes seemed to grow into a radiant Alpine land. At first we all stood transfixed, and hardly believed what we saw. Then, carried away by the reality of our good fortune, we burst forth into shouts of joy—"Land, land, land at last!" For thousands of years this land had lain buried from the knowledge of men and now its discovery had fallen into the lap of a small band, themselves almost lost to the world, who, far from their home, remembered the homage due to their sovereign, and gave to the newly discovered territory the name, Kaiser Franz-Joseph's land.

The fall and winter of the present year were occupied in determining more fully the extent and configuration of the island or Arctic continent just found. This work was conducted chiefly by means of sledge journeys to and over the rough surface of the country which they had dignified with the name of their emperor. One experience in the fissures of a glacier is especially worthy of being narrated.

PLUNGED HEADLONG INTO AN ICE GULF.

The party, after a brief halt, were just setting out again, when the snow gave way beneath the sledge-runners, and driver, dogs, and vehicle were precipitated into some unknown depth below. Payer first heard the confused shouting of the man, mingled with the barking and howling of the dogs from the bottom of the crevasse, many feet below. All this, says he, was the impression of a moment, while I felt myself dragged backward by the rope. Staggering back, and seeing the dark abyss beneath me, I could not doubt that I should be precipitated into it the next instant. A wonderful providence arrested the fall of the sledge; at a depth of about thirty feet it struck just between the sides of the crevasse, just as I was being dragged to the abyss by the weight. The sledge having jammed itself in, I lay on my stomach close to the awful brink: the rope which attached me to the sledge tightly strained, and cutting deeply into the snow.

By incredible tact and perseverance Payer at last freed himself from the sledge, and set about recovering the store of lost provisions, the manuscripts, which could never be replaced, and above all, about the rescue of the fallen comrade who was the "pride and gem of the party." Being the only one of the party accustomed to glaciers, Payer was of necessity almost alone in his exertions. Rushing back to the tent where most of the men had remained, he hurriedly explained what had happened, and all hastened to the spot of the disaster, leaving the tent and stores unwatched. They found their poor comrade nearly dead from the cold, but sufficiently conscious to be pulled to the top of the ice-cliff over which he had fallen. The dogs were found uninjured and quietly sleeping near him.

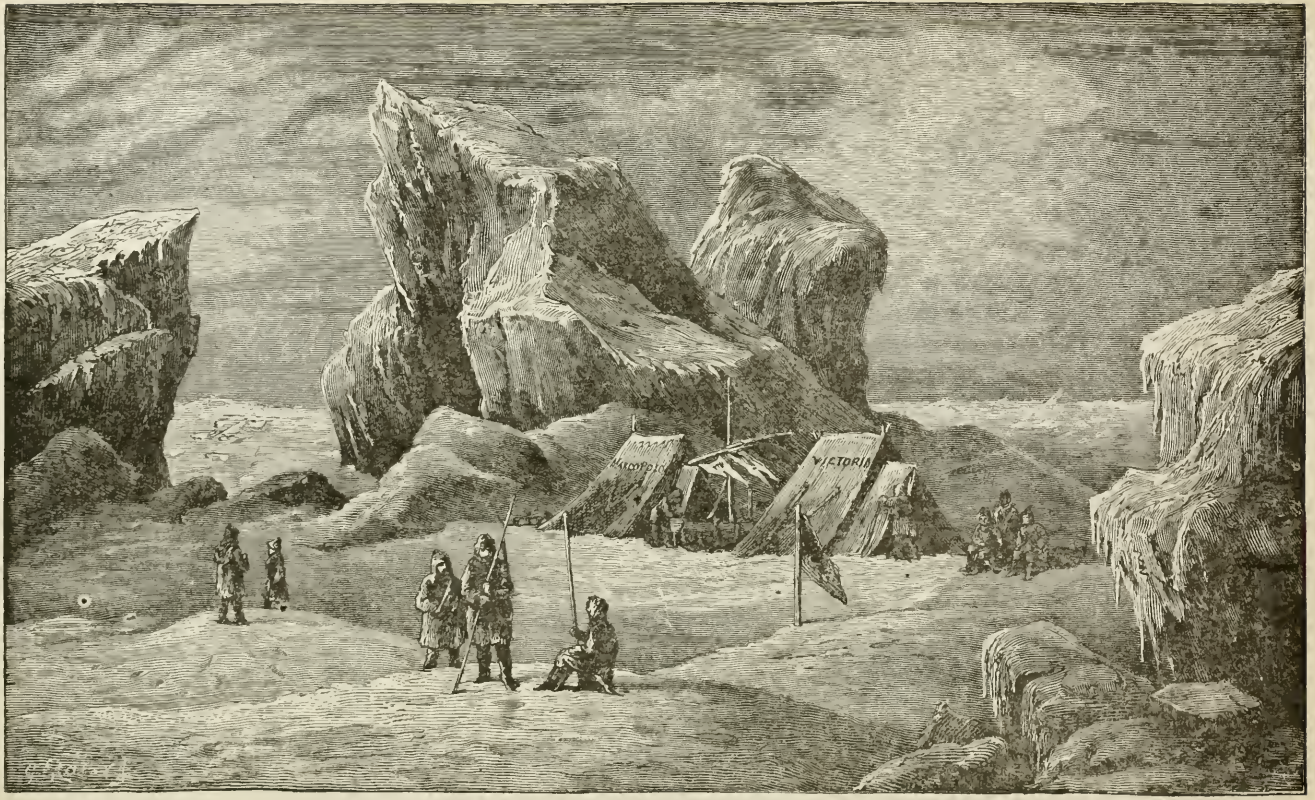
Franz-Joseph's Land was found to be almost as large as Spitzbergen, and to consist of two main masses between which runs a broad stretch of sea and ice, called Austria Sound. At the time of this exploration the sound was covered with ice for the most part not more than a year in growth, crossed in many places by fissures, and piled up with huge hummocks. The fact that here many icebergs were seen, which had not been the case in the Nova Zembla seas, warranted the supposition that they floated away from the ice-packs in a northerly direction. The experience of two winters in the ice had forced the party to the conclusion that the liberation of the "Tegetthoff" was too remote for them to save themselves by navigating the path over which they had come by its aid. Her abandonment was therefore universally agreed on, and the very day on which, in 1854, Kane had left the "Advance" on the coast of Greenland, was chosen for the first steps of their journey home which they finally succeeded in reaching after their long absence.

A REMARKABLE EXPLORING FEAT.

Another Arctic expedition, consisting of the ships "Alert" and "Discovery," under Captain Sir George Nares, Commander A. H. Markham, and Captain H. F. Stephenson, was sent out by the British Geographical Society in the year 1875. The officers and men of both vessels numbered one hundred and twenty, many of whom had seen Arctic service as whalers or explorers. On the voyage to Disco they had encountered much loose ice off Cape Farewell, and many heavy gales, in which they lost two of their whale-boats. Leaving Disco, the "Alert" and "Discovery" steamed across Baffin's Bay to the north-west, instead of hugging the Greenland shore, through Melville Bay, and struck the great central ice-pack. In thirty-four hours they succeeded in boring through the pack into open water—a feat never before performed, and which the Greenland masters declared "would ne'er be credited at Peterhead." It helped to prove the superiority of steam-power for Arctic navigation. Reaching the vicinity of Cape York, many icebergs were seen aground and closely crowded, indicating that they would perhaps not have fared so well had they taken the old route through Melville Bay, and around that cape. Pushing north they soon arrived at Carey Islands, where they landed and established a depot of supplies, depositing the usual record under a cairn.

The great exploring feat of the expedition was performed by Commander Markham's party. Accompanied by Lieutenant Parr, Dr. Moss and Mr. White, one of the engineers, and twenty-eight men, he set out for the north from Polaris Bay. The equipment consisted of four eight-men sledges—so called because each was manned by seven men and an officer; two boats for possible navigation in northern waters; four tents, eleven feet long, and about seven feet wide; and an ample stock of provisions to each sledge. The sledges were named Marco Polo, Victoria, Bulldog and Alexandra. The costume of the men was composed of a thick, woolen, blanket-like material, under a suit of duck to repel external moisture. On their feet, besides thick woolen hose, were worn blanket-wrappers and moccasins; and all wore spectacles as a protection against snow-blindness. Each slept in a separate bag of the same heavy woolen material as the day clothing, and the eight, in the compass of the eleven feet of tent, which was of the same warm material. Breakfast was taken before quitting the bags, and consisted of a pannikin of cocoa, some pemmican and biscuit. After five hours' travel a lunch of biscuit, with four ounces of bacon and a pannikin of hot tea, was taken; and at the close of the day's journey, varying from ten to twelve hours, when the tents were pitched, and all, except the acting cooks, snugly ensconced in their bags, a supper of pemmican and tea was served. With the pemmican was always mixed a certain proportion of preserved potatoes.

With the hummocks recurring every hundred yards or so, varying only in height, and the intermediate spaces covered with drifted snow-ridges, and the temperature almost constantly below zero, their progress was necessarily slow—very slow, snail-like and tortuous. The journey, says Nares, was consequently an incessant battle to overcome ever-recurring obstacles, each hard-worn success stimulating them for the next struggle. A passage-way had always to be cut through the squeezed-up ice with pickaxes, an extra one being carried for the purpose, and an incline picked out of the perpendicular side of the high floes, or roadway built up, before the sledges—generally one at a time—could be brought on. Instead of advancing with a steady walk, the usual means of progression, more than half of each day was expended by the whole party facing the sledge and pulling it forward a few feet at a time. Finally they were compelled to halt in the presence of a new enemy, the fog, which endangered their becoming entangled in a labyrinth of hummocks. This weary work was continued, with a constant increase in the number of the sick, when it was decided to leave them behind, while the stronger ones were to make a final push for the highest point attainable. A camp was established for the invalids, provisions and supplies, and left in charge of the cooks. Markham and Parr, with such of the men as were still in a condition to venture forward, set out, encumbered only with a few instruments and the national


MARCO POLO
VICTORIA

MEN OF THE "ALERT" ON THEIR MARVELOUS EXPEDITION.

colors. Markham thus relates the last advance: We had some very severe walking, through which the labor of dragging a sledge would be interminable, and occasionally almost disappearing through cracks and fissures, until twenty minutes to noon, when a halt was called. The artificial horizon was then set up, and the flags and banners displayed, these fluttering out bravely before a south-west wind, which latter, however, was decidedly cold and unpleasant. At noon we obtained a good altitude, and proclaimed our latitude to be exactly three hundred and ninety-nine and one-half miles from the North Pole. The leaders, Markham and Parr, though they had reached the highest point ever attained, were no more than half content at the meagre result of so many hardships. But they were destined soon to find that the decision to return was the salvation of the party, as almost all the men were stricken down with scurvy before reaching Depot Point, near Cape Joseph Henry. By forced marches and indomitable energy they succeeded in getting the men to camp; and while Markham watched and labored for their comfort, Parr set out for the "Alert," thirty miles away. Equipped with only a walking-stick and a couple of light rations, he trudged off alone to hurry up a relief party, stimulated by the consciousness that on his exertions depended the life-chances of those he had left behind. Fortunately he proved equal to the emergency, and in twenty-four hours reached the ship. Before midnight Captain Nares was on the way to Depot Point at the head of a relieving party. Lieutenant May, Dr. Moss and a seaman, with a light dog-sledge, were sent forward as a lightly equipped advance party, and reached the camp in fifty hours from Parr's departure. Short as had been the interval, one of the sick had died, and was already buried in the snow; but no other life was lost. Of the fifteen men who left Depot Point two months before with Markham and Parr, only three were able to assist in dragging the sledges back; three others struggled along behind, often falling and sometimes fainting; while nine had been utterly prostrated and had to be carried on the sledges. They had reached seventy miles north of Grant Land, but at the risk of losing their lives by exposure.

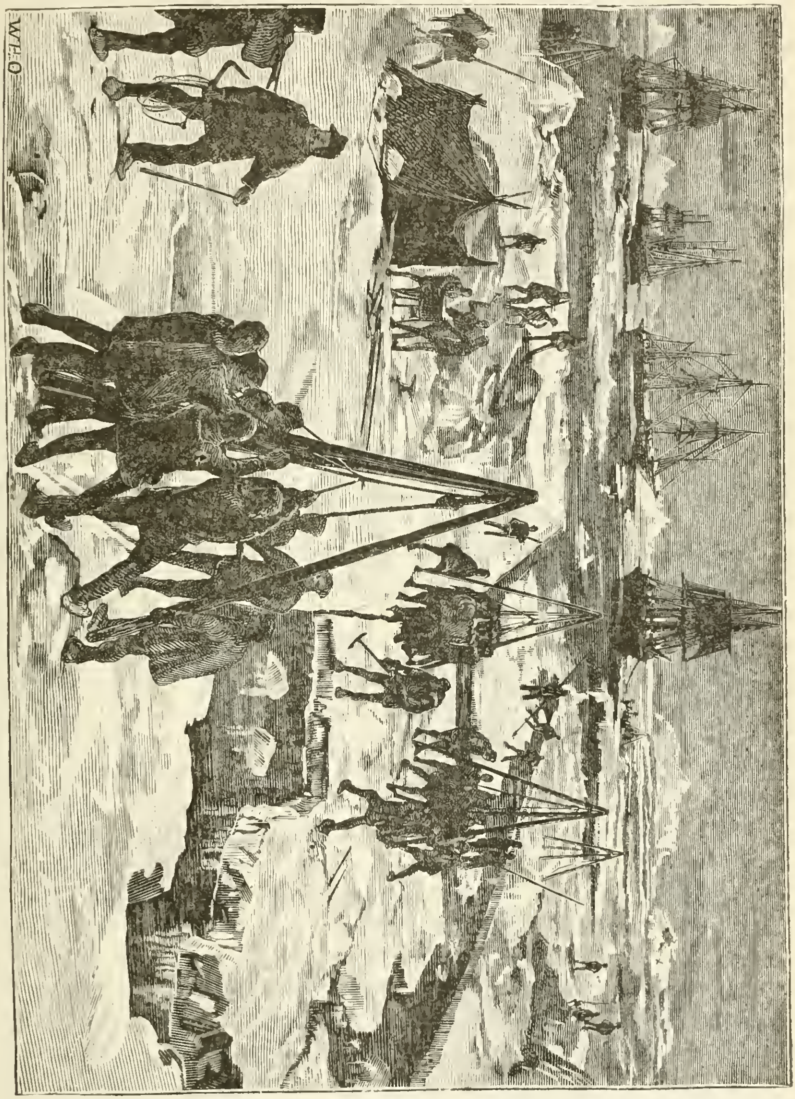
THE DARING VOYAGE OF NORDENSKJÖLD.

In June, 1878, the steamer "Vega," purchased at Bremerhaven, for the seventh and most celebrated Arctic voyage of Professor Nordenskjöld, left the harbor of Karlskrona. Besides the "Vega," with her company of thirty persons, of whom only four were seamen, the others being officers, engineers and scientists, four other vessels which belonged to a wealthy merchant, were at the disposal of the commander of the expedition, consisting of quite a little fleet, with the "Vega" as a sort of flag-ship.

The "Vega" reached Tromsoe, where she was to take aboard the commander. Here they shipped three walrus-hunters, and such special Arctic equipments as reindeer skins, besides coal and water. About fifteen days later than intended, they set out on the regular voyage, making for Maossoe, a small island of the Northern Archipelago, where they were to have their last mail facilities. Here they were detained three days by adverse winds, instead of that many hours, as anticipated. The Matotschin Sound divides Nova Zembla into two large islands of unequal size, the larger terminating at Barentz Land away to the north, the chief interest in which is connected with the fate of the early navigator, thus commemorated. A fresh interest has been awakened by the recent discovery of the winter-house erected by him and his companions at Ice Haven, in Barentz Bay, on the east coast of Barentz Land. In 1871, Captain Carlsen, a Norwegian, while circumnavigating Nova Zembla, discovered the house, with many interesting relics in a remarkable state of preservation, and brought them home, whence they found their way, through the zeal of Barentz's countrymen, to the Hague, where they are carefully preserved. No man has entered the lonely dwelling where the famous discoverer sojourned during the long winter of 1596, for nearly three centuries. There stood the cooking-pans over the fireplace, the old clock against the wall, the arms, the tools, the drinking-vessels, the instruments, and the books that beguiled the weary hours of that long night two hundred and seventy-five years before. Perhaps the most touching relic is the pair of small shoes. There was a little cabin-boy among the crew, who died, as Gerrit de Vere tells us, during the winter. This accounts for the shoes having been left behind. There was a flute, too, once played by that poor boy, which still gives out a few notes.

The more southern of the twin islands of Nova Zembla is separated from Vaigats Island to the south by the Kara Part, or passage to the Kara Sea. A part of this island is known as Gooseland, because of the great numbers of geese and swans which breed there. By the end of June, or early in July, the greater part of Gooseland is free of snow, and soon the Arctic flora discloses all its splendor for a few weeks. Giving themselves plenty of sea-room, but in the main following the trend of the land, they proceeded. From the Murman Sea to the west the land seemed a level, grassy plain, but on approaching the sound, low ridges were seen on the east side, which were regarded by Nordenskjöld as the last spurs of the great Ural range.

The expedition passed into the Kara Sea, which extends from Nova Zembla to Taimur Peninsula, receiving the waters of the Kara, Obi, Taz and Yenisei, through the gulfs bearing the same names. It was found that no notable portion of the mass of fresh water which these great rivers pour into the Kara Sea flows through Vaigats Sound into the Atlantic Ocean; and that, during autumn, this sea is quite available for navigation. At length they began to encounter ice, which finally so obstructed their progress that they were compelled to rally all hands and cut their way through. This is an experience not uncommon among Arctic navigators. After anchoring awhile in Port Dickson, on



THE EXPLORERS CUTTING A CHANNEL FOR THEIR FLEET.

Dickson Island, they reached Taimur Sound, and sailed by a large, high, unbroken field of ice, extending from a small bay on the west side of the peninsula. A little further on, they had the good fortune to find, just west of the low-jutting promontory—or rather in the fork of it—an open bay which they named King Oscar, and in which they came safely to anchor in the evening. They had nowhere met such old drift-ice as is encountered north of Spitzbergen. We had now reached a goal, says Nordenskjöld, which for centuries had been the object of unsuccessful struggles. For the first time a vessel lay at anchor off the northernmost cape of the Old World. No wonder, then, that the occurrence was celebrated by a display of flags, and the firing of salutes, and when we returned from our excursion on land, by festivities on board, by wine and toasts. The north point of Asia forms a low promontory, which a bay divides into two, the eastern arm projecting a little further to the north than the western.

While they followed the coast they found open water, always at a safe distance from the land on the one hand, and the ice-pack on the other. It was therefore demonstrated that, at least in seasons as favorable as 1878, the whole voyage may be made without meeting any serious obstruction from ice. One vessel of the fleet reached Lakoutsk in September amid great rejoicings, being the first ship that had ever reached that city, about eight hundred miles from the sea.

THE SHIP LOCKED IN THE ICE.

The "Vega" kept on to the east, and on the first of September they were near the mouth of the Indigirka. Here the temperature fell to one degree below zero. On the third snow began to fall, and when they arrived off Bear Islands, north of the mouth of Kolyma, both vessel and land were lightly covered with it. The channel west and south of the islands, through which they passed, was almost free of ice, but a little further out ice was abundant, and east of the islands, heavy masses were found to have drifted south. Indeed, ever since doubling Sviatoi Noss, the ice seen was more like that to be met off Spitzbergen, than any they had hitherto encountered on this voyage; but no icebergs or larger glacier blocks had been met or sighted. Beyond Cape North, the "Vega" at last found her way blocked by the ice-pack, and turning back, found temporary refuge near the cape, where they were detained. Finding no lane, lead, or outlet through the pack, the "Vega" was moored to a mass of ground-ice, which afforded a fair shelter, but no proper haven. This, however, proved to be the winter-quarters, except that later on ship and shelter were pushed by the outer ice to within seven-eighths of a mile of the coast. Soon the ice-belt which had obstructed their advance grew from six or seven to eighteen or twenty miles wide, and there was no longer any hope of getting away until the ensuing summer. They learned the grace of waiting.

During the winter months many excursions to interesting points were made by members of the expedition, by which valuable information was obtained about the country and its inhabitants, the Tschuktchi. At length the moment of release approached. The temperature had remained below freezing point to the middle of June. Then there was a sudden change to milder weather. A heavy thaw set in, and the coast land was so covered with mud and slush that all excursions had to be discontinued. But the ice which bound the ship was still so strong that the explorers did not expect to be able to leave before August. Throughout their stay there had been open water seaward, but usually at a great distance from the ship. The detention in winter-quarters had lasted two hundred and ninety-three days. They passed Serdze Kamen, and steering thence south-east, they arrived off Cape East in Behring Strait, and being about midway between the Arctic and Pacific Oceans, the "Vega" greeted the Old and New Worlds by a display of flags, and the firing of a Swedish salute. Thus finally was reached the goal toward which so many nations had struggled, all along from the time when Sir Hugh Willoughby, with the firing of salutes from cannon, and with hurrahs from the festive-clad seamen, in the presence of an innumerable crowd of jubilant men, certain of success, ushered in the long series of north-east voyages three hundred and twenty-six years before.

LIEUTENANT DE LONG'S WONDERFUL ADVENTURES.

The American Arctic Expedition, commanded by Lieutenant George W. DeLong, of the United States Navy, which left San Francisco in July, 1879, was projected by James Gordon Bennett, proprietor of the New York *Herald*. After the return of the last of the two successful expeditions which he had sent to Africa under Henry M. Stanley, Mr. Bennett decided to send out, at his own expense, an expedition to attempt to reach the North Pole by way of Behring Strait. Lieutenant DeLong became interested in the undertaking, and was made first officer. The "Jeannette" was the ship chartered for the expedition. The vessel sailed, and spent the first winter in an ice-pack.

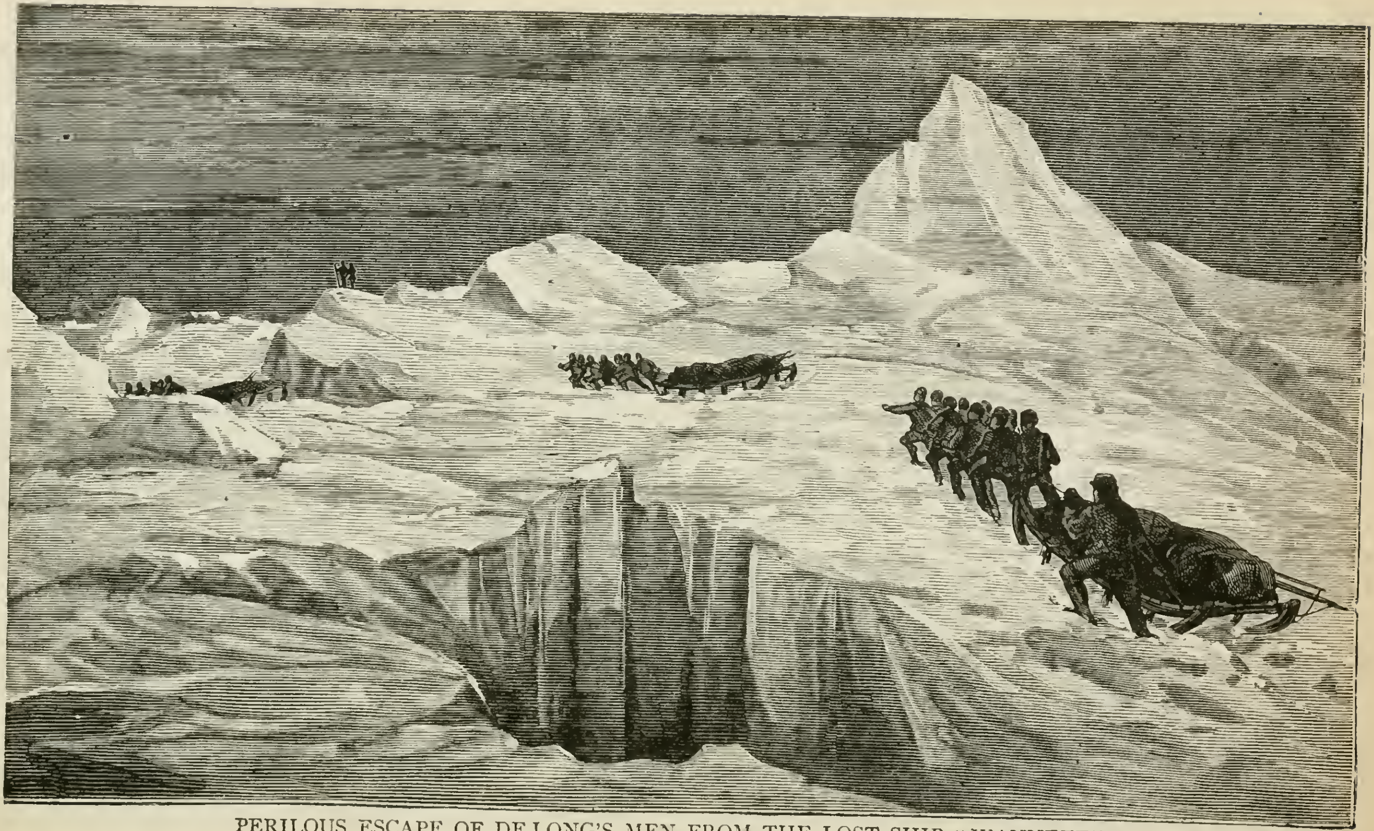
On the sixteenth of May, 1881, there was great excitement on board on account of having sighted land—the first land to greet the eye since March, 1880, fourteen months before. What it had to do in the economy of nature, standing desolate among the icy wastes, was not the question; it might be the spot to which the ducks and geese had been flying, and if the ship could get some of them for a change, what a treat! DeLong wrote: Fourteen months without anything to look at but ice and sky, and twenty months drifting in the pack will make a little mass of volcanic rock like our island as pleasing to the eye as an oasis in the desert. The rocky cliffs of the island appeared with a snow-covered slope, the highest and further corner seeming to be a volcano top. The "Jeannette" drifted past on the north side; the ice was so broken, and the pack running so rapidly that DeLong did not think it prudent to make an attempt to land. A few days later the pleasing sight was renewed, more land was ahead, and the ice very slack, with many large lanes of water varying in length from an eighth of a mile to three miles, and in width from twenty to one hundred feet. The lanes were very tantalizing; they seemed to be within a radius of five miles, but the islands were from thirty to forty miles off, and from that five miles radius to them, the ice was as close and compact as ever. On the thirty-first, estimating the distance to be but fifteen or twenty miles, Engineer Melville, in company with Dunbar and Nindemann, and three other seamen, set out from the ship with a fifteen-dog team to visit this second island. They landed on it, and took possession for the United States, naming it Henrietta—the name of a sister of Mr. Bennett; a cairn was built and a record was placed within it, and a limited examination made of twelve hours. It was found to be a desolate rock, surrounded by a snow cap which feeds several glaciers on its east face. Within the inaccessible cliffs, nesting dovekies were the only signs of life. To reach the land, the party left their boat and supplies, and carrying only one day's provisions and their instruments, went through the frightful ice mass at the risk of life, dragging the dogs, which, through fear, refused to follow.

A SUDDEN SHIPWRECK.

On the very day last named, the ice around the ship was broken down in immense masses, the whole pack being alive, and had the ship been within one of the fast-closing leads she would have been ground to powder. Embedded in a small island of ice, she was as yet protected from the direct crushing on her sides, but felt a continual hammering and thumping of the ice under her bottom. On the twelfth of June, at midnight, in a few moments' time, she was set free by the split of the floe on a line with her keel, and suddenly righting, started all hands from their beds to the deck. By morning the ice had commenced coming in on her side; a heavy floe was hauled ahead into a hole where it was supposed the ice coming together would impinge on itself instead of on the ship. The pressure was very heavy, and gave forth a hissing, crunching sound, and in the afternoon the ice was reported coming through the starboard coal bunkers. Melville went on the floe to take her photograph, but on returning to the ship heard the order to prepare to leave the vessel by gettting out the chronometers, rifles, ammunition, and other articles to the floe. When the order was given for all hands to leave the ship at about eleven at night, her water-ways had been broken in, the iron-work around the smoke-pipe buckled up, the rivets sheared off, and the smoke-stack left supported only by the guys. Three boats were lowered, the first and the second cutter, and the first whale-boat; and the ship's party of thirty-three made their camp on the floe in six tents, but within an hour were compelled to move still further from its edge by the breaking up of the floe in their camp.

At four o'clock in the morning the cry of the watch was heard, "There she goes; hurry up and look, the last sight you will have of the old 'Jeannette!'" While the ice had held together, it had held her broken timbers. When it opened—with her colors flying at the mast-head—she sank in thirty-eight fathoms of water, stripping her yards upwards as she passed through the floe. Daylight found the party encamped on the ice, about four hundred yards from where the ship went down. There were three ship-made sleds, each of which consisted of two oak runners, shod with whalebone. The grand total weight of sleds and provisions was about fifteen thousand pounds. To draw these the party had a working force, when the retreat commenced, of twenty-four men; and the dogs were employed, with two light sleds, to drag a large amount of stores, that the party had in excess to those permanently stowed upon the larger sleds. Each man had a knapsack; each knapsack contained one change of underclothing, one package of matches, one plug of tobacco, one spare pair of snow-goggles, and one spare pair of moccasins. The progress of the party toward the land was very slow, but finally glaciers and water-courses became visible. The party at length reached a point not more than two miles distant from the land, but the men were so exhausted that they had to camp. Next day Captain DeLong mustered everybody on the island, unfurled a silk flag, took possession of the island in the name of the President of the United States, and called it Bennett Island. The south cape was named Cape Emma, after the captain's wife.

In September the three sledges or boats left Semenovski Island on which the party had camped. A gale was commencing from the north-east. Captain DeLong was about five hundred yards distant from Melville, and Chipp seven hundred from DeLong. The gale increasing, both of these last were lost sight of by the whale-boat; the first cutter destined to land her party and make the sad experience of their intense suffering to death by cold and starvation; the second cutter to leave no record, but the blank to be filled by the reasonable supposition of her being swamped by the sea; and the whale-boat to be saved only by the successful use of a drag or sea-anchor, and the incessant baling by almost exhausted men. Engineer Melville was in command of the



PERILOUS ESCAPE OF DE LONG'S MEN FROM THE LOST SHIP "JEANNETTE."

first party, but relied on the professional ability of Lieutenant Danenhower, still on the sick-list. The pocket prismatic compass, useful on shore, where it could be leveled and the needle come to rest, was now unavailable. Steering was by the sun or the moon. Lieutenant Danenhower carried the watch and chart, and could shape the course of the boat by the bearings of the sun at this equinoctial period. September fifteenth, one of the eastern mouths of the Lena was entered, and, by the assistance of a Tungus pilot, the party pushed up the river, and reached a small village, in which lived a Siberian exile, Kopelloff, who proved very useful in opening the way to intercourse by teaching the Lieutenant Russian phrases. They were detained at this place waiting for the growth of the ice for sledding, and while another Russian exile, with the chief of the village, went forward to Bulun to inform the Russian authorities of their arrival. On the seventeenth of October, Danenhower began his search with a dog-team, to explore the coasts for the missing boats, but was unable, from the condition of the ice, to proceed far in any direction, and returned without results.

The following sad history is derived from the records of Commander DeLong, showing the fate of the party that accompanied him. After various entries which give a pitiful picture of the sufferings endured in this desperate attempt to make their way homeward, the narrative continues: September twenty-fourth, late in the evening, made a rough bed of a few logs! wrapped our blankets around us, and sought a sleep that did not come. On the twenty-seventh five men arrived in camp, bringing a fine buck. Saved again! September thirtieth, one hundredth and tenth day from leaving the ship, Erickson is no better, and it is a foregone conclusion that he must lose four of the toes of his right foot, and one of his left. The doctor commenced slicing away the flesh after breakfast, fortunately without pain to the patient, for the forward part of the foot is dead; but it was a heart-rending sight to me, the cutting away of bones and flesh of a man whom I hoped to return sound and whole to his friends. October first, and where are we? I think at the beginning of the Lena River at last. My chart is simply useless. Left a record in the hut that we are proceeding to cross to the west side, to reach some settlement on the Lena River. October third, nothing remains but the dog. I therefore ordered him killed and dressed by Iverson, and soon after a kind of stew made of such parts as could not be carried, of which everybody, except the doctor and myself, eagerly partook; to us it was a nauseating mess. Erickson soon became delirious, and his talking was a horrible accompaniment to the wretchedness of our surroundings. During the night got his gloves off; his hands were frozen. In the morning got Erickson (quite unconscious), and lashed on the sled under the cover of a hut, made a fire and got warm. Half a pound of dog was fried for each one, and a cup of tea given, and that constituted our day's food. Soon our messmate, Erickson, departed this life. October sixth, as to burying him I cannot dig a grave, the ground is frozen, and I have nothing to dig with. There is nothing to do but to bury him in the river. Sewed him up in the flaps of the tent, and covered him with my flag. Got tea ready, and with one half-ounce alcohol, we will try to make out to bury him. But we are all so weak, that I do not see how we are going to move. Read the burial service, and carried our departed shipmate's body down to the river, where, a hole having been cut in the ice, he was buried; three volleys from our Remingtons being fired over him as a funeral honor.

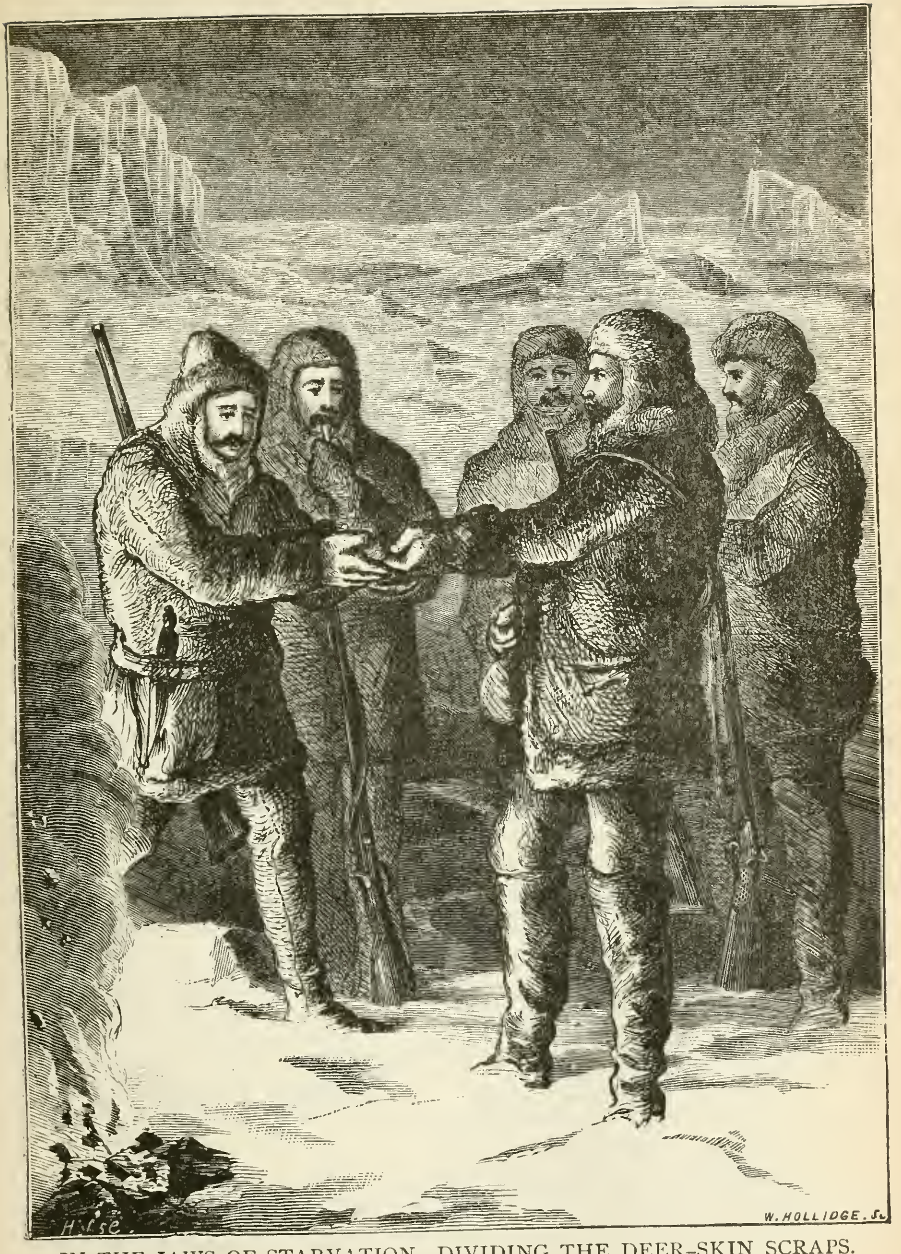
For supper half pound dog meat and tea. Under way again next day; had for dinner one ounce of alcohol. Find canoe, lay our heads on it and go to sleep. Next morning we divide a few deer-skin scraps, all that is left us now, and this is but a poor relief from starvation.

Ahead again till eleven. At three, halted; used up. Crawled into a hole on the bank. Nothing for supper, except a spoonful of glycerine. Alexei died, covered him with ensign, and laid him in a crib. October twenty-first, one hundred and thirty-first day, Kaack was found dead at midnight. Too weak to carry the bodies out on the ice; the doctor, Collins and I carried them around the corner out of sight. Then my eye closed up. Sunday, slept or rested all day, then managed to get enough wood in before dark. Read divine service.

The preceding brief extracts from this saddest of all journals tells the story of the first cutter, excepting that of the two saved, Nindemann and Noros. The captain, the surgeon, and the last one of the crew must have perished immediately after the last one of their comrades.

ANIMAL CURIOSITIES OF THE ARCTIC WORLD.

It is in the waters of this latitude that the seal and walrus abound. These are among the curiosities of the Polar clime, as they are among the wonders of animal life, and are worthy of the naturalist's study. The walrus has an immense size, and is very clumsy and awkward in his movements; that is, when he gets on land; in the sea he can swim readily enough. He can use his two large tusks when he wants to dig up the shell-fish, or the roots of some plant that grows near the sea. And he can use them to drag his unwieldy body up the rocks, or up some block of ice. He can fight with them against the fierce polar bear. In spite of this, the bear sometimes gets the mastery, and kills the walrus by giving him one of his bear's hugs. Sometimes the dead body of a walrus is cast ashore, and then there is great excitement among the sea-birds and animals. The sea-birds come whirling round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IN THE JAWS OF STARVATION—DIVIDING THE DEER-SKIN SCRAPS.

and scream with delight. The foxes and the bears scent it from afar; but the foxes dare not approach until the bears are satisfied. So they stand round barking with impatience.

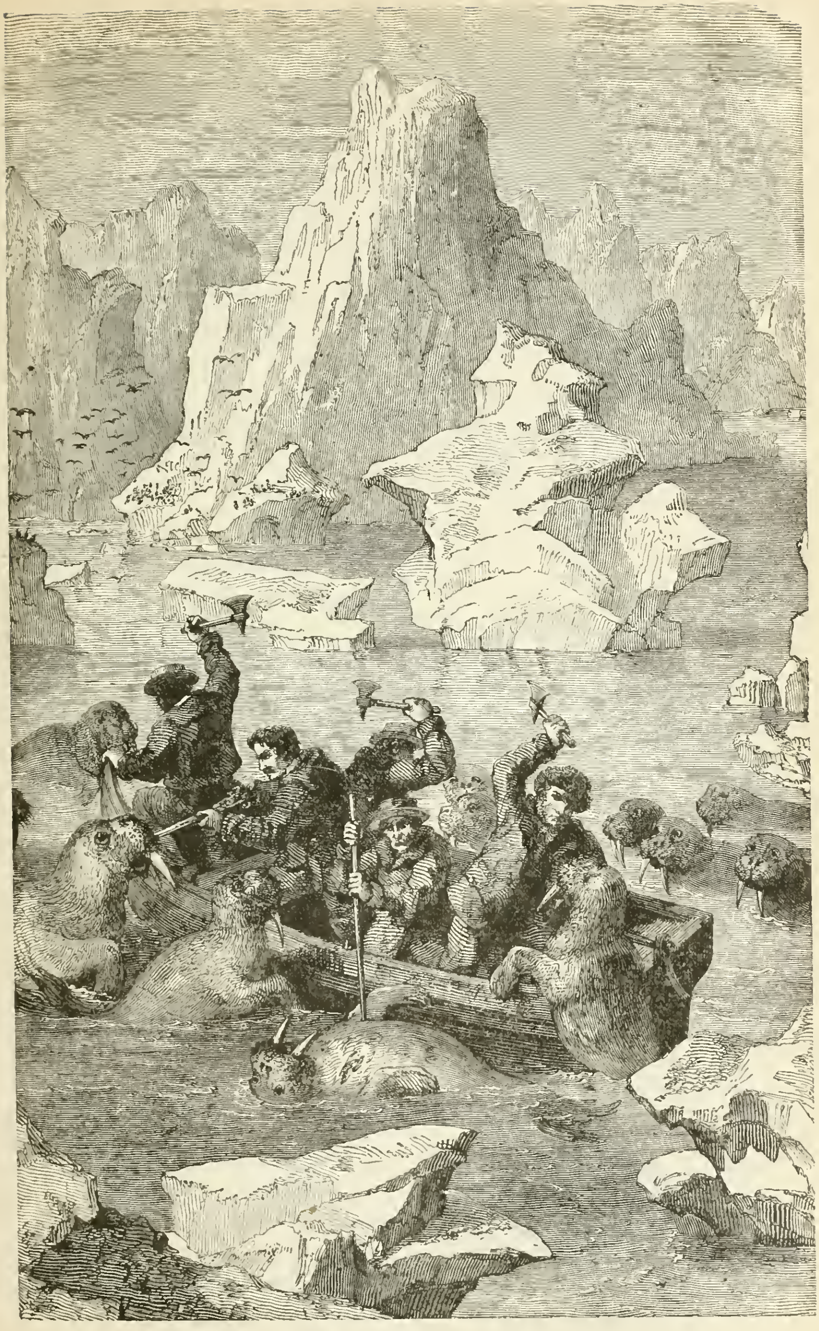
If man were present, he would dispute the prize. For the walrus is a treasure to the dwellers on those desolate shores. His flesh forms an article of food, and is keenly relished. His skin is used for leather, and the ivory of the tusks is invaluable. In spite of his great size and fierce tusks the walrus can be tamed, and is very affectionate. A Russian lady is said to have tamed a young walrus, and made a pet of it. The creature followed her about, and was never so happy as when it lay with its head in her lap, and was being fondly petted.

Fierce encounters have been known to take place between the explorers in the North and shoals of walruses, which sometimes show great bravery in defending themselves against attack, and at times even turning upon the boat and men, putting their lives in danger. They will attempt to enter the boat, and only by hatchets or some other hand-weapon can they be repulsed and captured.

Human life in these far regions is even more wonderful than that of the lower animals. It is hardly credible that in these bleak territories of endless snow and winter people should be found who prefer their snowy surroundings to all the glories of more tropical climes, and would not exchange their snow-villages for the splendor of any metropolis in either hemisphere. Yet such is the astounding fact.

A PEOPLE UNLIKE ALL OTHERS.

There is not a more singular people on the earth than those living within the Arctic belt; nomadic, and yet all their resources are taxed to procure a living; always pressed for food, and yet wonderfully hospitable; true barbarians, but none the less peaceable and clever. Away in the chilly North nature withholds her gifts of food and warmth, and then with hard and pitiless niggardness, she drives such chilly blasts as if life within her sphere had angered her. Under a glintling sky of frost, within an unbroken landscape of inexpressibly lonesome desolation, the Esquimau makes his home and lives, despite the rigor and barren waste of his nameless country. These wonderful children of eccentric creation are controlled by no law, either written or traditional, and acknowledge accountability only to their own conscience, and yet they are orderly and given little to crime. They have patriarchs in their tribes who give advice, but never assert authority. Esquimaux children render singular obedience to their parents, even after reaching maturity, which proceeds from a remarkable fraternal devotion, for there is no such thing as punishment of a male child by its parents. Females, however, fare badly, for it is considered quite

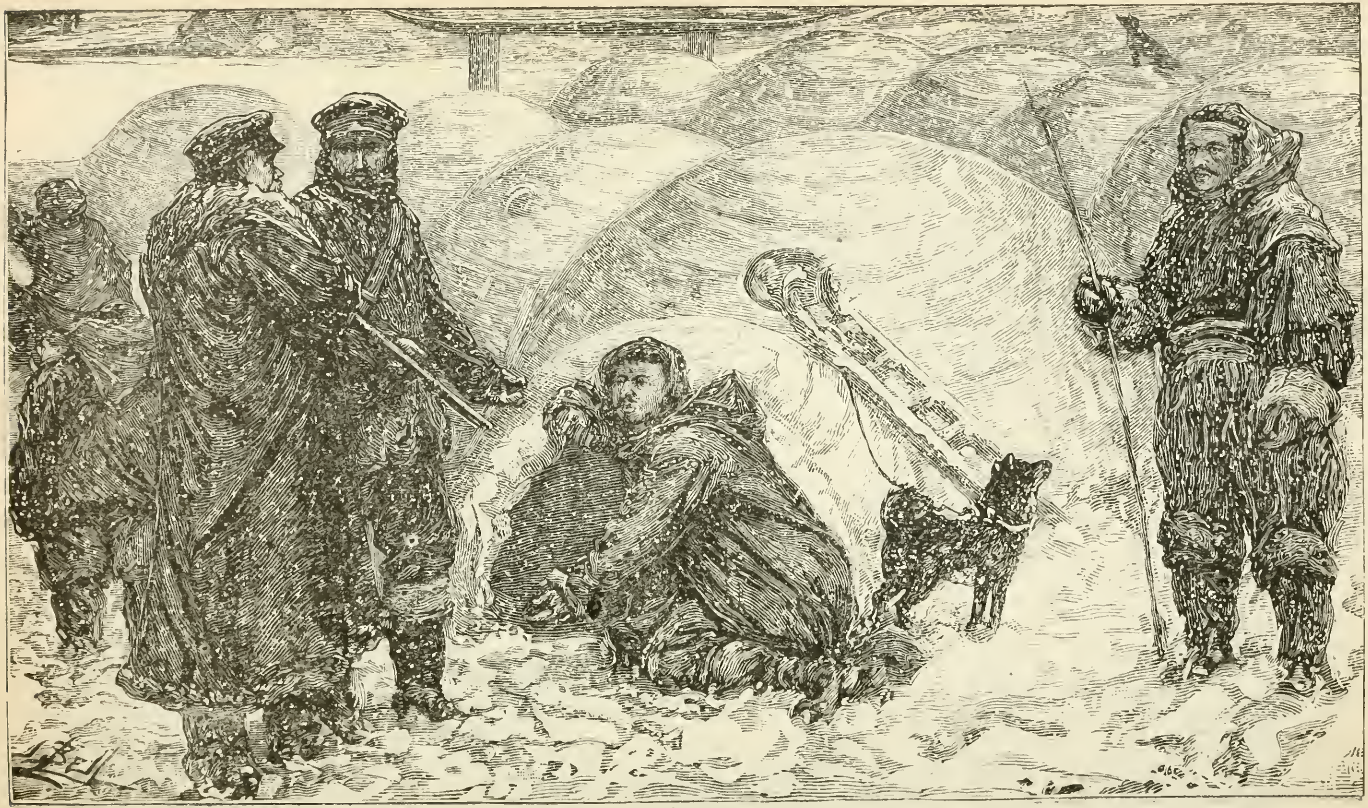


A FIERCE ENCOUNTER AT CLOSE QUARTERS.

proper to control the female sex with an iron hand. In former times, at least among some of the Esquimaux tribes, it was customary for the parents to smother all their girl babies except one. Girls are married before they reach twenty, a thing not difficult to do, owing to their scarcity and the polygamous practices of the men. As soon as a man dies his widows are almost immediately appropriated by others. Another convenient custom which they practice is to exchange wives when, for any reason, the consorts of a man who is about to set out on a journey cannot accompany him. There are always other women who will take their places, and thus a clever exchange is effected.

An exchange of children is also sometimes made, while the giving away of infants is an ordinary occurrence. Children are rarely weaned before they reach seven and eight years of age, though they begin eating meat at one year. Marriage among these savages is purely and entirely a matter of convenience, as love is a feeling unknown to them. Wives are usually purchased for a trifle, and after being taken to their husbands' igloos (huts), they are tattooed in the forehead with a character resembling the letter V. Others tattoo themselves for ornamentation, but without regard to definite figures, straight lines being mostly made, and these confined principally to the chin. Their dress is admirably adapted to the severity of their climate. With their two pairs of breeches made of reindeer or seal skin, the outer one having the hair outside and the inner one next the body, and their two jackets —of which the upper one is provided with a great hood—with their water-tight seal-skin boots, lined with the downy skins of birds, and their enormous gloves, they bid defiance to the severest cold, and even in the hardest weather pursue their occupations in the open air whenever the moon is in the sky, or during the doubtful meridian twilight. The dress of the two sexes is much alike, the outer jacket having a pointed skirt before and behind, but that of the females is a little longer. The women also wear larger hoods, in which they carry their children ; and sometimes the inner boot has in front a long, pointed flap, to answer the same purpose.

The Esquimaux are no less skillful in the construction of their dome-shaped huts of a single room. These they make from blocks of frozen snow, which are cut out with knives made of walrus bone. These blocks are not more than two inches thick, and thus admit considerable light while serving well to keep out the wind. When more light is required, a small window is cut, over which a sheet of ice is placed, or a well-oiled piece of dried deer skin. To secure warmth in specially severe seasons, which it seems they have a faculty of forecasting, the Esquimaux dig out a large space, deep enough to contain their huts, so



A UNIQUE VILLAGE—ESQUIMAUX HOUSES.

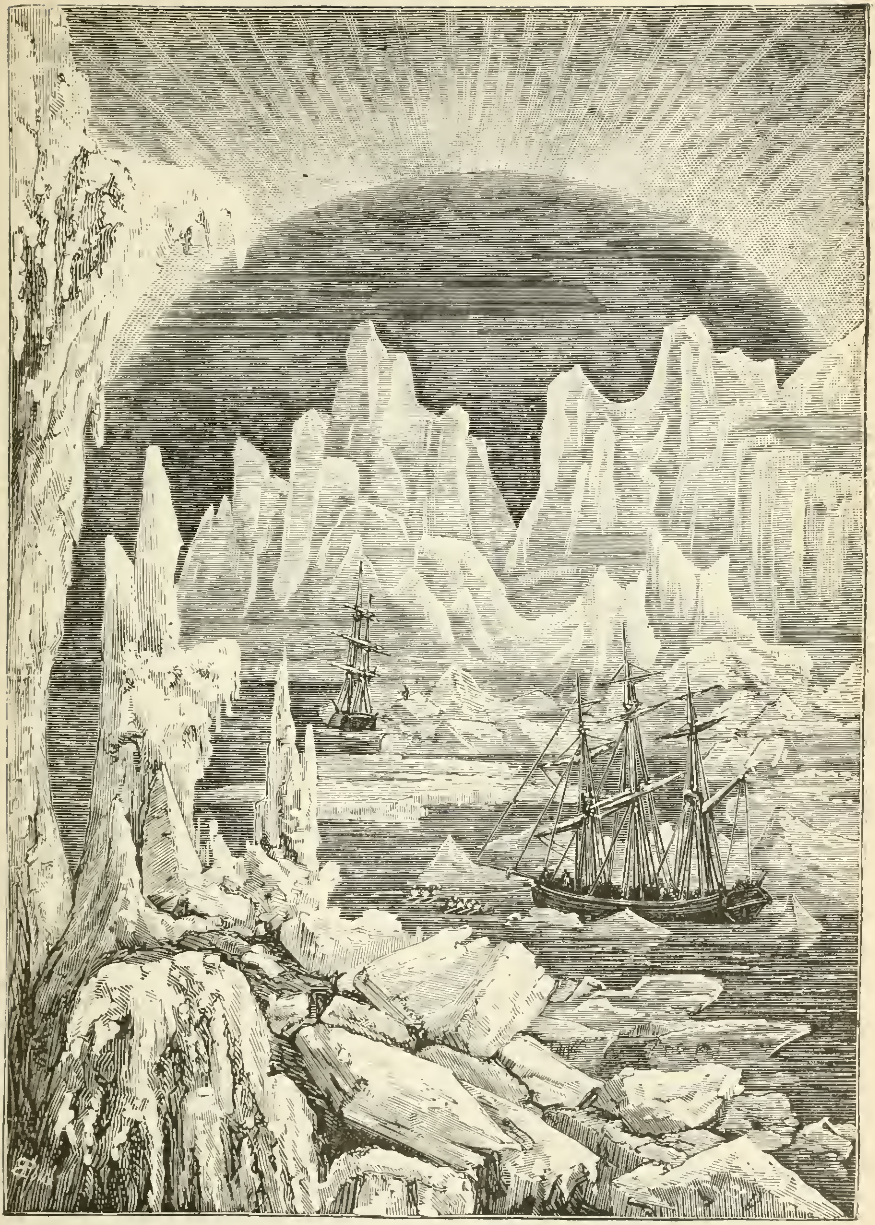
that the dome will be even with the surface of the earth. To reach this underground habitation they dig a tunnel, usually about fifteen feet long, which first slants downward, then upward, where it enters the hut; the tunnel is so low that it can only be entered by creeping on the hands and knees. As may be imagined, these huts are very warm, the temperature inside reaching ninety degrees above, while outside it is fifty degrees below zero. The fitting up of the igloo—always the work of the igloo wife—is done by first placing the stone lamp in its proper position, trimming it, and setting over it a kettle of snow; then placing boards upon the snow-platforms for beds, and spreading over them the canvas, containing some pieces of a dry shrub, gathered for this purpose, and on this the tuk-too, or reindeer-skins; over the fire-lamp the wet clothing is hung, to be turned during the night by the wife.

The Esquimaux subsist on an exclusively meat diet, and all eat like gourmands. Cleanliness is something which they do not appreciate, but in this they are excused by the rigor of their climate, which makes water both scarce and disagreeable. Usually they prefer uncooked flesh, though sometimes they boil their meat, but only for the soup it yields. Their mode of eating from a fresh carcass is ingeniously curious. They cut the meat in long strips, one end of which is introduced into the mouth and swallowed as far as the powers of deglutition will allow, then cutting off the portion left protruding from the mouth, they repeat the process of swallowing. It is a singular mode of eating.

VIVID AURORAL SPLENDORS.

Other useful and marvelous information is to be derived from the various expeditions, undertaken especially in the interest of science, or for the relief of explorers who have been in peril.

An aurora borealis, as seen by the colonists at Upernavik, is thus described by one of their number: It first appeared in an arch extending from west-by-north to north-east; but the arch shortly after its first appearance broke up and disappeared. Soon after this a new display began in the direction of the western foot of the first arch, preceded by a bright flame, from which emanated rays of a pale straw-color. Another simultaneous movement occurred at both extremities of the arch until a complete segment was formed of wavering perpendicular radii. As soon as the arch was complete, the light became greatly increased, and the prismatic colors, which had before been faint, now shone forth in a brilliant manner. The strongest colors, which were also the outside ones, were pink and green, on the green side purple and pink, all of which were as imperceptibly blended as in the rainbow. The green was the color nearest the zenith. This magnificent display lasted a few minutes; and the light had nearly vanished, when the



SHIPS AND ICEBERGS ARCHED BY THE MARVELOUS AURORA.

north-east quarter sent forth a vigorous display, and nearly at the same time a corresponding coruscation emanated from the opposite extremity. The western foot of the arch then disengaged itself from the horizon, crooked to the northward, and the whole retired to the north-east quarter, where a bright spot blazed for a moment, and all was darkness. There was no noise audible during any part of the phenomenon, nor were the compasses perceptibly affected.

Before the display of these natural fireworks commences, the sky seems to prepare itself. Its hues deepen, until a well-defined segment of dark sky is marked off, its base resting on the northern horizon; along the line of its arc, and as if from behind the dark segment, a flashing luminous light begins to play, so that soon the whole curve is one line of light. This light seems like a continuous phosphorescent cloud; it is never still, but rises, and falls, and breaks—now in one place, now in another—continually sending out tongues of flame, which shoot up the zenith. When these luminous palpitating rays reach their greatest extent the sight is truly wonderful. The aurora sometimes assumes the shape of a beautiful fringed curtain hanging in graceful folds from the arch of the firmament. The prevailing color is red, though it changed its hues rapidly.

These aurora are by no means local appearances. In 1796 one was witnessed simultaneously in France and Pennsylvania, and, of course, in all the intermediate countries. The best observations, which, however, are not absolutely certain, find these streams of light to be about one hundred miles high; we may judge, therefore, over what a wide expanse they are visible, when we remember that often they occupy the whole horizon. Although they are seen more in winter than summer, it is only because the nights of winter are longer, and, therefore, there is more opportunity for observation. If there be any variation in the frequency of their appearance throughout the year, they seem to be more numerous about the time of the equinoxes. The cause of this wonderful phenomenon is not known. There can, however, be no doubt that if it be not due to electricity itself, it is closely allied to it. When the aurora is being displayed, the magnetic needles are agitated, and currents of electricity stream along the telegraph lines, causing the needles to deflect; the most remarkable fact being that the influence which the aurora has on telegraph lines is totally different to that exercised by a thunder-cloud. In 1859, at the end of August, the aurora monopolized for hours and worked on its own account several of the lines in the United States, chiefly those which had a direction from north to south. The European telegraphs were similarly affected by the same aurora.

Every philosopher knows that electricity plays a very prominent part in the affairs of our earth, but as yet we are all but ignorant of its exact effects. Yet it would seem that the aurora indicates the paths of vast currents of electric fluid which circulate through and about our world. The streams always appear to leave one pole for the other.

Enough has here been described to show the marvelous character of the Polar world. Those who have explored it are among the greatest adventurers and heroes. As an instance of the dreadful sufferings which they have encountered, it may be stated that when the vessels of the Greely relief expedition reached St. John's, the world was told that only six members of the Greely colony were living. One had been drowned, one had died on the way home, and seventeen, it was said, had perished by starvation. This was a shocking story, but soon a much more terrible one was to be told. When their food gave out the unfortunate members of the colony, starving in their tent on the bleak shore of Smith's Sound, were led by horrible necessity to become cannibals! The complete history of their experience during that terrible winter has afterwards been told by one or the other of the survivors, and makes one of the most dreadful and repulsive chapters of the annals of Arctic exploration. Greely and his surviving companions were forced to choose between death and this way of preserving life, and they have chosen the latter. From July, 1882, to August, 1883, not less than fifty thousand rations were taken in the steamers "Neptune," "Yantic," and "Proteus" up to or beyond Littleton Island, and of that number only about one thousand were left in that vicinity, the remainder being returned to the United States or sunk with the "Proteus." Two costly expeditions had taken those provisions to Smith's Sound, but Greely and his men gained practically no benefit from them. Greely's instructions and the plain teachings of common sense were disregarded. He foresaw that he might be compelled to retreat down the west shore of Smith's Sound; he could establish provision depots along the upper part of the line, but those below must be established by the relief parties. In his instructions he pointed out the spots on the west side where food should be placed, and then directed that a colony should be established on the other shore. He even foresaw that he might reach Cape Sabine and then be unable to get across; therefore, he directed that the relief colony should not only strive to find him by telescope, but should also send sledge parties to the west side to rescue him. His instructions were not heeded, and the terrible sufferings, the death, and the cannibalism of Greely and his men resulted from this neglect.

CHAPTER XIII.

WONDERFUL MOUNTAINS AND MOUNTAINEERING.

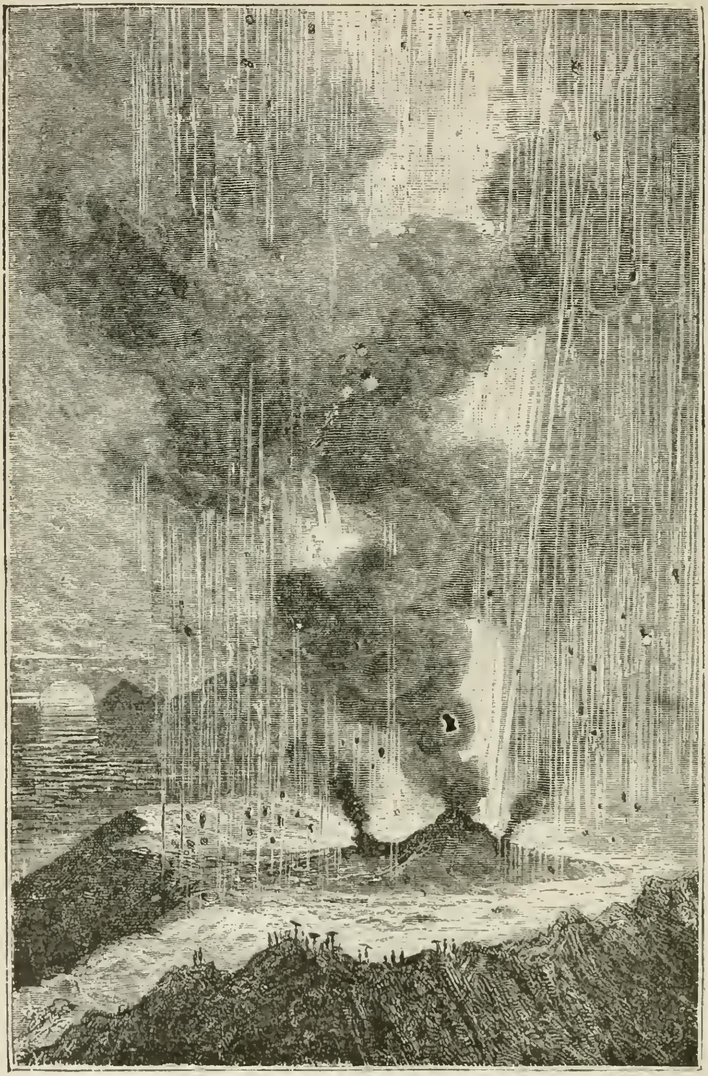
Burning Peaks of Iceland—Fiery Vesuvius—Frightful Chasms of Mont Blanc—Gigantic Shadows on the Brocken—A Fantastic Cascade—The Harz Mines and Miners—Mount Etna—An Immense Tree—Far-Famed Ararat—The Peter Botte—Sublimity of American Scenery—The White Mountains—A Rock with an Open Mouth—Majestic Summits of the Southern Rockies.

THE eruptions of volcanoes in Iceland have been among the most terrible of those carefully recorded. The cold climate of the island and the height of the mountains produce vast quantities of snow and ice, which cover the volcanoes and fill up the cracks and valleys in their sides. When, therefore, the eruption commences, the intense heat of the boiling lava, and of the steam which rushes forth from the crater, makes the whole mountain hot, and vast masses of ice, great fields of snow, and deluges of water roll down the hill-side into the plains. The lava pours from the top and from cracks in the side of the mountain, or is ejected hundreds of feet, to fall amongst the ice and snow; and the great masses of red-hot stone cast forth, accompanied by cinders and fine ashes, splash into the roaring torrent, which tears up rocks in its course and devastates the surrounding country for miles. An eruption of Kotlugja, in 1860, was accompanied by these dreadful floods. It began with a number of earthquakes, which shook the surrounding country. Then a dark columnar cloud of vapor was seen to rise by day from the mountain, and by night balls of fire (volcanic bombs) and red-hot cinders to the height of nearly five miles, which were seen at a distance of one hundred and eighty miles. Deluges of water rushed from the heights, bearing along whole fields of ice and rocky fragments of every size, some vomited from the volcano, but in great part torn from the flanks of the mountain itself and carried to the sea, there to add considerably to the coast-line after devastating the intervening country. The fountain of volcanic bombs consisted of masses of lava, containing gases which exploded, producing a loud sound, which was said to have been heard at a distance of a hundred miles. The size of the bombs, and the height to which they must have reached, were very great. The great volcano of Hecla, in the same island, had been nearly quiet for eighty years, but in 1845 a violent eruption took place, which lasted a long time. A mass consisting of no less than five hundred feet of the top of the mountain was blown away by the rush of the lava, which poured down the valleys on the side of the volcano in such a vast quantity as to reach ten miles. Its thickness was from fifty to eighty feet. Another Icelandic volcano, Skaptar Jokul, burst forth in 1783, and cast out enormous streams of lava, one about fifty miles long and fifteen broad, and the other forty in length and seven wide. The thickness of these streams of molten rock was in some places more than five hundred feet, and it has been calculated that the entire mass exceeds in bulk the highest mountain in Europe.

A MOUNTAIN OF FIRE.

One of the large volcanoes in the Sandwich Islands has, when quiet, a lake of liquid lava in the hollow or crater on its summit. This lava, like all others, consists of different rocks which have been dissolved deep down in the earth below the volcano by steam confined in a small space, and therefore by what is called high-pressure steam. It resembles dark bottle-glass, but under the microscope pieces of the original rock may be detected. On the surface of the lake the lava is cooled more or less by the escape of steam and by the wind, and a sort of fine slag is formed; this is pumice-stone; and when the lava is ejected, the pumice becomes red-hot and is cast up in vast quantities. Thus, when the volcano Tomboro, in the Eastern Sea, was in eruption in 1815, the first notice of it was a number of explosions, which were heard at Sumatra, nearly one thousand miles off in a straight line. Three distinct columns of flame were seen to rise from the mountain to a vast height, and its whole surface soon appeared as if covered with fiery lava streams. The flames were really vast masses of the pumice or scoriæ shooting up into the air, and they fell for miles around. The pumice and the powder of it were in such quantities that they darkened the air, caused complete darkness in Java, eight hundred miles off, and covered the ground and roofs of houses to a depth of several inches. The floating pumice upon the sea around formed a layer two feet thick, through which vessels with difficulty forced their way. Sometimes the force with which the light pumice is cast up is so great, that upper currents in the air blow vast collections of it to a great distance, and the first notice of the eruption of some volcanoes in out-of-the-way countries has been given by showers of ashes in well-known localities, often several hundreds of miles distant.

The great volcano named Vesuvius, which is now so constantly in eruption, was described by the ancients as a cone-shaped mountain with a flat top, on which was a deep circular valley filled with vines and grass, and surrounded by high precipices. A large population lived on the sides of the mountain, which was covered with beautiful woods, and there were fine flourishing cities at its foot. So little was the terrible nature of the valley on the top understood, that in the year 72, Spartacus, a Roman rebel, encamped there with some thousands of fighting men, and the Roman soldiers were let down the precipices in order to surprise and capture them. There had been earthquakes around the mountain, and one of the cities had been nearly destroyed;



TERRIFIC ERUPTION OF THE GREAT CRATER OF VESUVIUS.

but no one was prepared for what occurred seven years after the defeat of Spartacus. Suddenly a terrific rush of smoke, steam and fire belched from the mountain's summit; one side of this treacherous valley was blown off, and its rocks, with vast quantities of ashes, burning stones and sand, were ejected far into the sky. They then spread out like a vast pall, and fell far and wide. For eight days and nights this went on, and the enormous quantity of steam sent up, together with the deluge of rain that fell, produced torrents on the mountain-side, which, carrying onwards the fallen ashes, overwhelmed everything in their way. Sulphurous vapors filled the air, and violent tremblings of the earth were constant. A city six miles off was speedily rendered uninhabitable, and was destroyed by the falling stones; but two others —Herculaneum and Pompeii—which already had suffered from the down-pour of ashes, were gradually filled up with a flood of water, sand, and ashes, which came down the side of the volcano, and finally were covered up entirely. In succeeding eruptions much lava was poured out; and in the year 472, ashes were cast forth over a great part of Europe, so that much fear was caused at Constantinople. The cities were more and more covered up, and were only discovered in 1713, when, in digging a well, a theatre with some statues was disclosed. Since then numerous curiosities have been dug up, wonderfully preserved by the ashes.

The recent exhumation of those towns, and the consequent recovery of a series of remarkable memorials of that antique society which previously was but dimly seen in the pages of poets and historians, has reflected, as it were, a new and singular interest on the mountain so fatally associated with their annals. We cannot think of Herculaneum and Pompeii without thinking of Vesuvius, which was at once their destroyer and preserver; suddenly arresting their current history and checking their flow of prosperous life, in order, as it would seem, that later generations might be able to contemplate that history and survey that life in all their original freshness! Thus it is that Vesuvius has acquired a world-wide fame, to which no mere considerations of height or grandeur could have entitled it.

Vesuvius, as seen from Naples, is a two-headed mountain; the peak to the left is the Somma, that to the right is the volcano itself; they are separated by a deep valley. At the mouth of the valley, on a plateau forming quite a natural belvedere, are situated the Hermitage and the Observatory. The first stage of the ascent takes to the former.

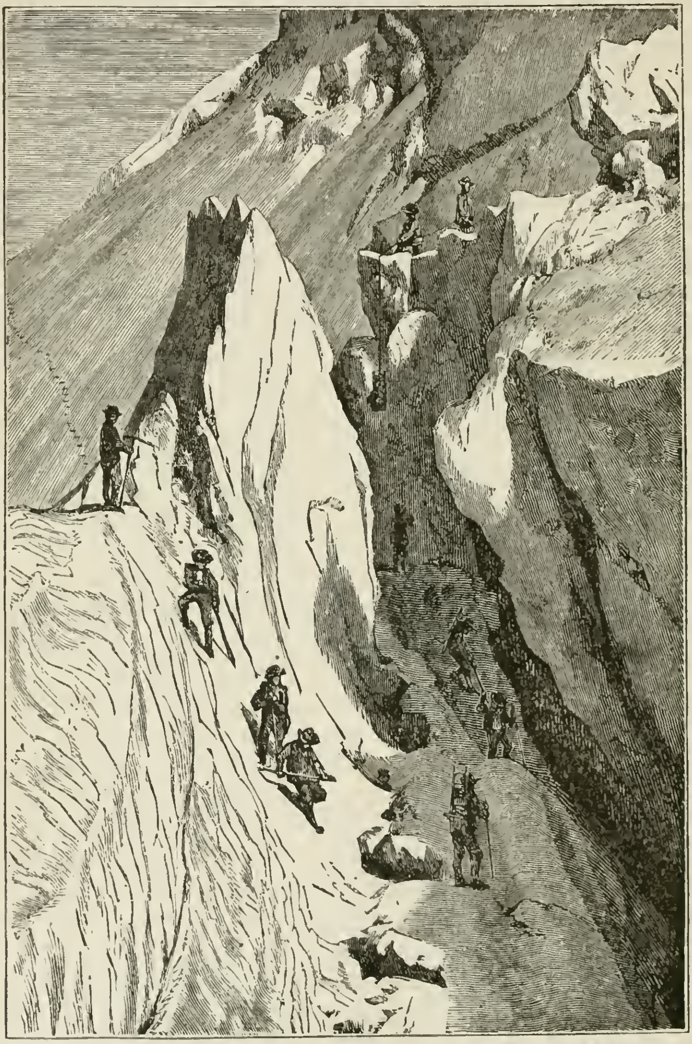
The sight is splendid—especially in the evening, when the sun halts for a moment over the island-rocks of Ischia, like a wheel of fire, before it makes haste to sink behind the peaks which it touches with glorious flame. But the picture which lingers longest in the memory is a moonlight effect, such as was seen from the Hermitage, on the occasion of the last eruption. Then half the mountain slept in shadow, while the rest was luminous, as was the kindling sea; the heights of Sorrento were tinted with bronze on their sides, and silver on their brow; Capri shone in a shimmering milky way of light; afar off, in the mist, lay Misenum and Ischia, the distant Mediterranean, and, beyond, a world of dreams; nearer, the city, with the lighthouse on its mole, and the pale reflections of its lighted quays—a row of glow-worms under a border of houses—and behind, the mountain on fire, with its indescribable glories of leaping flames and strange electric coruscations. At such a time all eyes are attracted to the crater, as it vomits flames, ashes, masses of rock, and even a kind of red and burning snow, which, falling back in flakes of fire on the slopes of the cone, accumulates there, to roll down headlong in formidable avalanches, and cover the lands, and swallow up houses, and bury cities, and defy the strength and skill of man to arrest its progress, in its onward sweep of destruction.

ALPS PILED ON ALPS.

The Alps form the most important European mountain-system, and contain the loftiest peaks. They strike across the north of Italy, from the shore of the Mediterranean, and extend to the borders of Hungary. Geographers divide them into distinct groups or masses, to which distinct names are attached. The culminating summit of the Alps is Mont Blanc, which has long reigned supreme among European mountains. Its position is remarkable, for it is almost equidistant between the Pole and the Equator. A huge pyramidal mass, elongated from north to south, so that it resembles the hump of a dromedary, girt round with soaring pinnacles, furrowed by enormous glaciers, and shrouded perpetually in ice and snow, it presents a remarkably majestic aspect, and impresses the spectator with a wonderful feeling of sublimity and power. Hence it has long exercised a strange fascination over the minds of men, and its ascent has become one of those enterprises which offer a peculiar attraction to the adventurous. Its summit was first reached by Paccard and Jacques Balmat in August, 1785. Since that time ascents have entered into the ordinary holiday programme of the bolder class of tourists; though the undertaking is one which requires considerable strength, endurance and resolution, and the direction of efficient guides. Several ladies have accomplished it, however.

The ascents of Mont Blanc have not always been made from a thirst for adventure, or to gratify a commonplace curiosity, but in the highest interests of science; and to those accomplished by Saussure, Agassiz, Forbes, Tyndall and Charles Martins, we are indebted for much of our knowledge of glaciers and glacial phenomena. In the annals of science no mountain occupies a more distinguished place; while it has furnished the artist with inexhaustible sources of inspiration. We favor the reader with a thrilling account of the ascent by M. de Saussure, and we allow that courageous man of science to tell his own story: I started on the first of August accompanied by a servant, and by eighteen guides, who carried our scientific instruments and all the apparatus of which I had need. In order to feel perfectly free in my selection of places where to pass the nights, I took with me a tent; and on the first evening I reposed under its canvas roof on the summit of the peak of La Côte. The second day's march is not the easiest. You must first cross the glacier of La Côte, to gain the foot of a small chain of rocks which lie imbedded in the snows of Mont Blanc. This glacier is both difficult and dangerous. It is intersected by broad, deep, irregular crevasses; and often you can traverse these only upon bridges of snow, which are sometimes very slight, and suspended over formidable abysses. One of my guides nearly perished here. The day before, in company with two others, he had gone to reconnoitre the route; fortunately they had taken the precaution of tying themselves together with ropes; the snow gave way beneath him in the middle of a broad, deep crevasse, and he remained suspended between his two comrades. We passed very near the opening which had formed under him, and shuddered at the sight of the peril he had incurred.

After reaching these rocks we kept away from them at first, in order to mount by a winding path to a snow-loaded valley, which runs from north to south to the foot of the loftiest summit. The snow was cut at intervals by enormous and superb crevasses, the sharp, clean section of which showed the snow arranged in horizontal layers, each layer representing a year's formation. However wide the crevasses, you can nowhere discover their bottom. My guides were fain to have spent the night near one of the rocks which we fell in with on this route; but as the loftiest were still three thousand six hundred feet below the summit, I wished to ascend to a higher point. For this purpose, it was imperative that we should encamp in the middle of the snows; but I had much difficulty in reconciling my companions to such a course. They imagined that during the night an absolutely unendurable degree of cold prevailed in the upper regions of the snow, and seriously feared lest they should perish there. At length I told them that we would dig deeply in the snow, and cover the excavation with the canvas of the tent; beneath which we would all ensconce ourselves, and we should not suffer from the cold, however rigorous it might prove. My guides at once set to work to excavate a place which might form our quarters for the night; but they quickly felt the rarefaction of the air. Robust as they were, scarcely had they thrown out five or six spadefuls of snow before they were compelled to abandon the task; it was necessary to relieve one another every minute, as exertion made breathing more difficult.



PERILOUS DESCENT THROUGH THE GREAT CREVASSE, MONT BLANC.

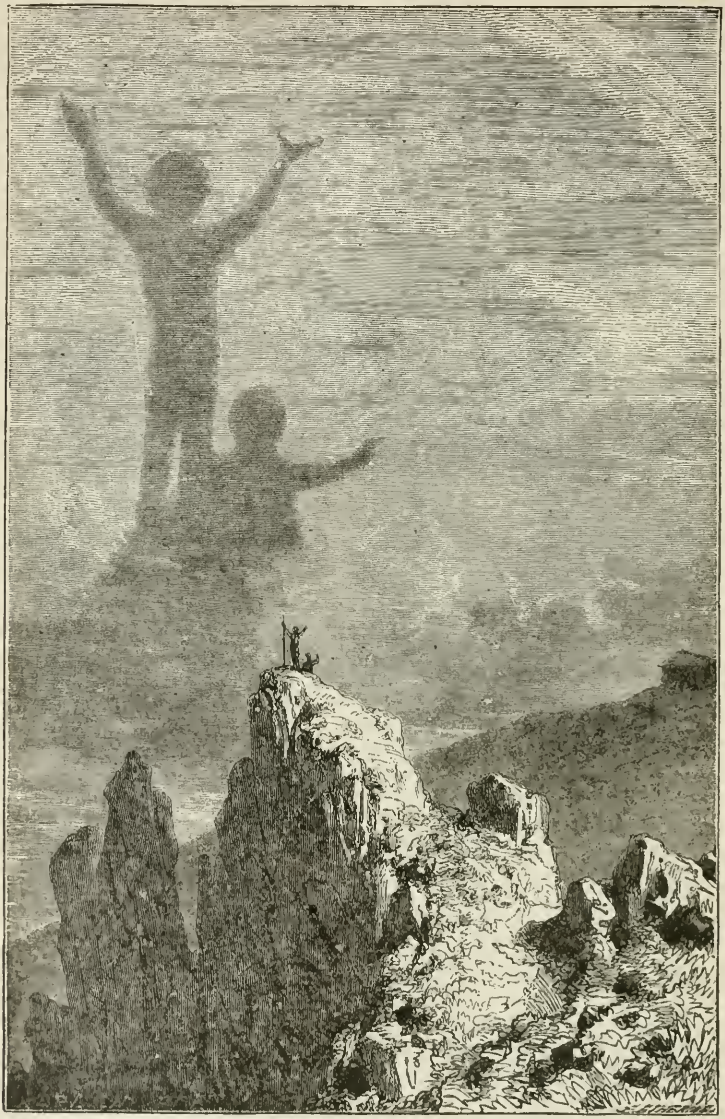
From the middle of this plateau, inclosed between the topmost peak of Mont Blanc to the south, its lofty eastern terraces and the dome of the Goûté on the west, we could see nothing but snow; snow spotlessly pure, of a dazzling whiteness, and on the higher summits forming a very singular contrast with the intensely blue, nay, the purple-black sky of these elevated regions. No living being was visible, no appearance of vegetation; it is the abode of cold and silence. My guides, constantly pre-occupied with fear of the cold, closed so carefully every chink and crevice of our tent that I suffered greatly from the heat and from the air corrupted by our breath. In order to breathe freely, I was compelled to go out into the night. The moon shone with the greatest splendor in the midst of a sky as black as ebony. Jupiter, all radiant, emerged from behind the loftiest peak to the east of Mont Blanc; and the light reverberated from all this vast amphitheatre of snow was so dazzling, that I could distinguish only stars of the first and second magnitude. At length we began to sleep, when we were awakened by the crash of a great avalanche which covered a part of the slope we had ascended the day before. At dawn the thermometer marked three degrees below freezing-point.

We began by ascending to the third and last plateau; then we diverged to the left in order to gain the loftiest rock lying east of the topmost peak. The acclivity is exceedingly abrupt and everywhere it abuts upon precipices; and so hard was the surface of the snow, that those who went in advance could not steady their steps until they had broken it with a hatchet. We spent two toilsome hours in climbing this acclivity. Having reached the summit-crag, we turned to the right—that is, to the westward—in order to ascend the final incline. Owing to the excessive rarefaction of the air, a man's strength is very readily exhausted. Near the summit, I had to stop to take breath at every fifteen or sixteen steps. At intervals, indeed, I experienced a weakness which compelled me to sit down; but always as my respiration recovered itself my physical energies revived; and, on resuming my march, I felt for the moment as if I could dart like an arrow to the very crest of the mountain. The guides, in proportion to their strength, were in the same condition; some better, some worse. Hence, it took us two hours to climb from the last rock to the summit.

THE MARVELOUS BROCKEN.

In the Harz Mountains there is a celebrated summit which tourists in that region always expect to visit. A strange shadow of any object is thrown from one point upon the cloud or mist opposite, and forms one of the wonders of that locality which has long been described in prose and song as the home of spectres and witches, and supernatural beings. The figure of a child takes on the appearance of a giant.

The visitor to the Harz must travel afoot, with his portmanteau on his back, if he would penetrate into the less frequented and the wildest localities. When crossing an immense plain, luxuriant with splendid crops, we perceived several young persons mounted on stilts, and making with a kind of rattle a deafening noise, intended to put to flight the few sparrows which came to peck at the ears bending over the furrowed way. These robust young guardians, who spent all the day in the fields, certainly received at each meal, in the shape of bread, more



THE FAMOUS SPECTRE OF THE BROCKEN.

grain than the birds would have carried away in a week. The inaction of their vigorous arms bore testimony to the trifling value of manual labor, which amounts to little and is poorly requited.

The Harz is composed of enormous blocks of granite, the base of which rises several hundred feet above the sea-level. Its area is thirty-six square miles. The mountains are generally isolated, and form huge conical peaks, separated by deep and narrow valleys, especially in the north of the Harz. A chain of mountains divides this country into two parts; several rivers rise in it. Not a leaf stirs; the trees along the road are silent, yet seem disturbed; great belts of greenish-gray clouds rest upon the horizon. To the left, the Brocken shows itself above a framework of mountains, the upper portion of which is sharply outlined against the sky; a dull, leaden-colored mist spreads over the valley, and obscures and confounds its various features.

A WONDERFUL CASCADE.

The Ilsenstein is an immense rocky precipice, washed by the winding flood of the river Ilse, a stream very famous in song and fable. One explorer says of it: It is impossible to describe the vivacity, the boldness, the grace, with which the Ilse descends on the fantastic groups of rocks she encounters in her career. Here the waters hiss wildly, or roll in spray and foam; there they leap in crystal arches over a labyrinth of crevasses; and, lower down, they dance across the mossy pebbles like frolicsome nymphs.

Here are various phenomena that are well worth a study. One of the most remarkable of all mountain sights is a kind of mirage, to be seen only from the top of the Brocken. It is there known as the Spectre of the Brocken; and very spectre-like it looks in the red evening sun. You no sooner step out upon the plateau on the top of the hill, than your shadow, grim and gigantic, is apparently flung right out against the eastern sky, where, with all visible space for a play-ground, it flits swiftly from place to place, following your every movement, This weird-looking phenomenon surpasses any description in words. It is only in the evening just before sunset that the phenomenon is visible, so that the shadow is doubly exaggerated, first by the distance and level of the sun, and then by the distance of the surface upon which it is projected.

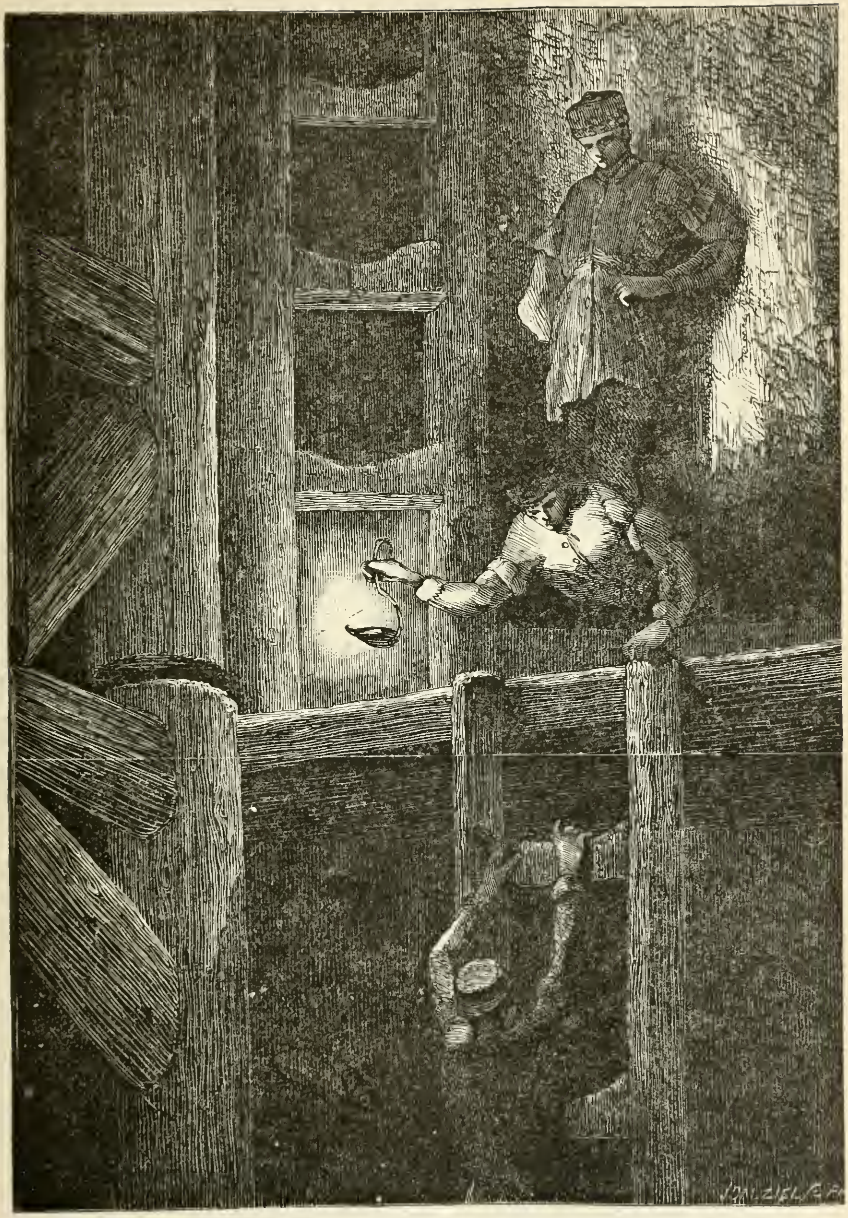
The explanation of the Spectre of the Brocken is very simple. To the east of the Harz Mountains there is always a very dense and hazy atmosphere, so dense that it presents a surface capable of receiving the impression of a shadow and of retaining it as a wall does. When, therefore, the sun gets round to the west, the shadows of all objects that are near enough to this surface are projected upon it. It is not the fact that these shadows are flung out, as they appear to be, upon what is called the sky, they are all close at hand. And the chances are that if it were possible to walk straight out towards them from the top of the Brocken, the spectator would very soon get behind them. To produce the mirage in miniature, let the reader take a red-hot poker and look along it horizontally towards an object (say some letter of the alphabet) stuck upon the wall a few feet away. He will soon see the inverted image of the object a few inches from the end of the poker, and a few inches above it, and have a case of mirage on a small scale.

A MARVELOUS MOUNTAIN INTERIOR.

The Harz is celebrated for its mines, and a visit to these is as indispensable on the part of the tourist as the ascent of the Brocken. There are two ways of descending into the mines. Formerly, at regular intervals in a special compartment of the shaft, was arranged a succession of stages, platforms, or landing-places, communicating with one another by ladders ; and the visitor ascended or descended by means of these. In many places this arrangement is still kept up. But the fatigue of climbing up or down vertical or almost vertical ladders, for a depth of two thousand feet, is very severe. The miners spent an hour or an hour and a half every morning and evening in the wearisome exercise, to the great trial of their strength and the loss of their time. So, in some of the mines, the ascent and descent are accomplished, as in our coal mines, in the buckets, cradles, or suspended cages, used also for the removal of the ore or coal. These are lowered or raised by ropes passing over pulleys, and worked by hand or by steam power, and afford an expeditious method of transit.

Having accomplished our descent into a mine, our first inquiry will be as to its ventilation. How do the miners breathe in these underground recesses? How are they provided with a sufficient supply of pure atmospheric air ? For we feel that the temperature is not disagreeable nor the odor oppressive. On the other hand, we are conscious that a cellar or subterranean excavation, if only a few feet below the surface, is by no means a healthy or agreeable residence. How, then, do the miners contrive to enjoy a tolerably healthy climate at a depth of two thousand feet in the bowels of the earth ? The process of ventilation, though somewhat complicated in its details, is very simple as a whole.

Metallic mines, like those of the Harz, do not require a very active circulation of the air ; all that is necessary is to carry off that which has already been respired by the workmen, which has fed their lamps, and been vitiated by the process of blasting. There is no occasion to fear, as in coal mines, the irrespirable and explosive gas which is disengaged from the surface of the coal. Special machines, however are



A REMARKABLE MINE IN THE HARZ—DESCENDING THE SHAFT.

sometimes made use of to renew the air in the inner parts of the mine. But frequently a natural ventilation is sufficient; the fresh air enters through the lowest openings, shafts, or galleries, grows warm in the mine, and accordingly rises and passes away through the higher shafts, just as the heated atmosphere of our rooms escapes through the chimneys. In all cases the direction of the air-current, and its proportion, is regulated by means of doors, which prevent it from seeking the shortest way, and compel it to feed those places most in need of it.

The lights used by the Harz miners are lamps of classic form; which are supplied, before descending, with a lump of fat for distinguished visitors, or with oil for workmen. The same system of lightage is adopted for the solid galleries and those navigated in boats, in spite of the regret of all lovers of the picturesque, who naturally would prefer the weird effects produced by the shifting glare of torches. And yet it is fortunate that such lamps, with their naked and powerful flame, can be safely employed. In coal mines the presence of an explosive gas compels the miner, as everybody knows, to surround the flame with a metallic network, which prevents its combustion from spreading externally, and, at the same time, so masks the flame that darkness swallows up everything at a foot or two from the lamp's flickering flame.

GARDENS ON THE SURFACE AND FIRE BENEATH.

Mount Etna, one of the most remarkable of the European volcanoes, is situated on the east coast of the island of Sicily. A high road winds round its lower slopes with a total circuit of ninety-three miles; but if we take the sea, and the rivers Simeto and Cantara, as defining its natural boundaries, we must reckon its total circumference at one hundred and twenty miles, and even this limit will not include the whole of the district over which it pours its lava floods. Its Greek name is intended to indicate pre-eminence—the "mountain of mountains," which Etna assuredly is, so far as the Mediterranean basin is concerned.

The ascent of Mount Etna is peculiarly interesting, because it conducts the traveler through three distinct zones of climate and vegetation, which graduate, so to speak, from the semi-Oriental to the Alpine. The lowest of these zones is celebrated for its fertility. It stretches up the acclivities of the mountain to a distance varying from two miles on the north, to ten or eleven miles on the south. Its soil, consisting of decomposed volcanic matter, yields abundant harvests of corn, and wine, and fruit. The air is soft and bland; the winds breathe warmly, as if influenced by the subterranean fires; the slopes laugh with flowers, and are decked with groves of chestnuts and Oriental planes; orchards and vineyards seem to yield their treasures almost spontaneously; while the landscape everywhere echoes with the music and brightens with the sunshine of copious streams. Villages and convents are numerous: the former are reckoned at sixty-five, with a population of three hundred thousand, and their condition generally appears peaceful and prosperous.

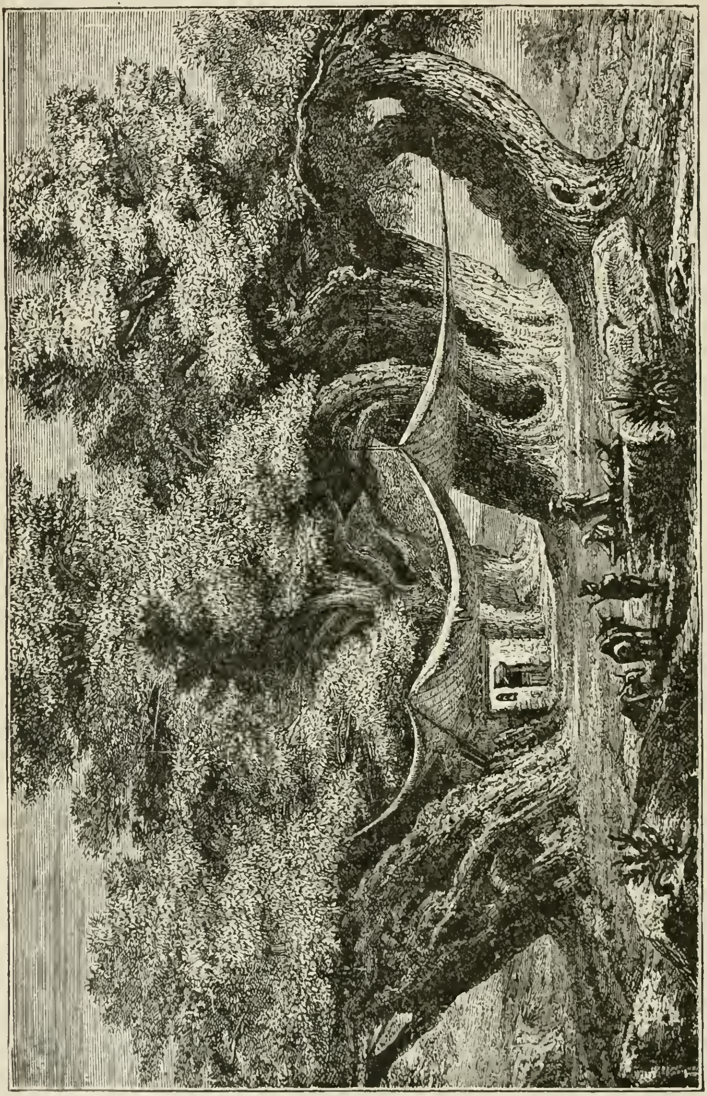
Every picture, however, must have its shade; and here, as in other parts of Etna, the slopes are furrowed by the black channels of ancient lava-streams, bearing significant witness to the terrible power of the subterranean fires, and conveying to the mountaineers a warning of possible calamity which they regard with supreme indifference.

A TREE THAT CAN SHELTER A HUNDRED HORSEMEN.

From this zone we pass into the wooded region, or forest. The botanical aspects of the forest differ, however, in different districts. At Bronte, pines of goodly stature abound. At Paternò, the oak, the beech, the ilex and the fragrant lime. Poplars mingle with the oaks and pines near Matello; while hawthorn and cork-trees, fir, beech and oak intermingle their shades in the adjoining district. Between Mascali and Piraino, a woody tract of oak-trees and of immense chestnuts affords a delightful shelter to numerous flocks and herds. Here is found that botanical marvel, the Castagno di Cento Cavalli, which can receive a hundred horsemen beneath its leafy canopy. The scenery of this region is rich in picturesque effects, which recall the old poetic descriptions of the classic Arcadia. The forest recesses are the home of game and wild animals of almost every description; the wild boar, the roebuck, the fox, the badger, the porcupine, wild cats, weasels, ferrets, the eagle, the falcon, the partridge and a host of song-birds. And here, too, the Etnaen flora, which includes a great variety of species, may be examined in all its beauty.

We pass on to the Desert Region, the upper part of which is fitly called the "Abode of Snow." At first the traveler meets with a few stunted plants and lichens, as in the frozen wastes of Greenland, but soon he leaves even these scanty traces of vegetation behind him, and climbs a dead ascent of ashes, scoriæ and lava to the great cone, which incessantly pours forth a cloud of sulphurous vapor. From June to October this region is bare and black; but during the rest of the year Nature conceals its desolation with a thick mantle of snow. The air is chill and piercing, and the eye nowhere lights on a sign of life.

We must not omit to allude to what Sir Charles Lyell has aptly and justly called the grandest and most original feature in the physiognomy of this remarkable mountain—namely, the number of comparatively small cones scattered over its declivities. These, in relation to the colossal bulk of Etna, are like the protuberances on the rind of an orange; but in some places they would pass for lofty hills. About eighty of these minor volcanoes are found at different parts; cones of eruption, with rent and broken craters, which now in general form the most romantic wooded basins imaginable, but in some instances retain their original ruggedness and naked desolation.



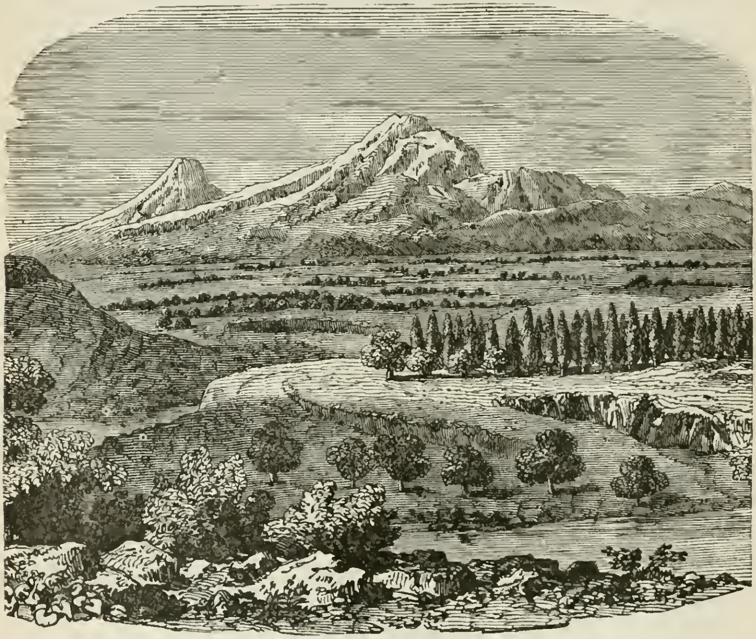
THE MARVELOUS CASTAGNO DI CENTO CAVALLI.

Mr. Gladstone, who ascended the mountain, has left on record a descriptive narrative, from which we take the following passage: To ascend the highest peak our choice lay between a precipice and a corner of a crater. We went over the lava in a very warm atmosphere, sometimes, on passing a rift, too hot for a moment or two to breathe. We got upon the back of the peak, and worked up through the sulphur-clouds, which here alone were seriously disagreeable. We here gazed upon the eastern view, embracing the Messina mountains and the fine kindred outline of the Calabrian coast. From thence the view stretched all along the southern coast to Cape Passaro. But our chief object from this point was the crater of the opposite side, into which, having now reached a position higher than any part of it, we had a considerable insight. We enjoyed keenly our full, clear sight of the volcanic action, and even at the moment I could not help being struck with the remarkable accuracy of Virgil's account. The great features of this action are the sharp and loud clap which perceptibly shook from time to time the ground of the mountain under our feet; the sheet of flame, which leaped up with a sudden momentary blast, and soon disappeared in smoke; then the shower of red-hot stones and lava. At this time, as we found on our way down, lava masses of two hundred pounds weight were being thrown to a distance of probably a mile and a half; smaller ones we found even more remote. These showers were most copious, and often came in the most rapid succession. Even while we were ascending the exterior of the cone, we saw them alighting on its slope, and sometimes bounding down with immense rapidity within perhaps some thirty or forty yards of our rickety footing on the mountain-side. They dispersed like the sparks of a rocket; they lay, beneath the snow, over the mountain, thicker than even the stars in heaven; the larger ones ascended as it were with deliberation, and then descended first with speed and then with fury. Now they passed even over our heads, and we could pick up some newly fallen, and almost intolerably hot. Lastly, there was the black-gray column, which seemed smoke, and was really ash, and which was shot from time to time out of the very bowels of the crater, far above its edge, in regular, unbroken form, rising high in the air.

THE FAMOUS MOUNT ARARAT.

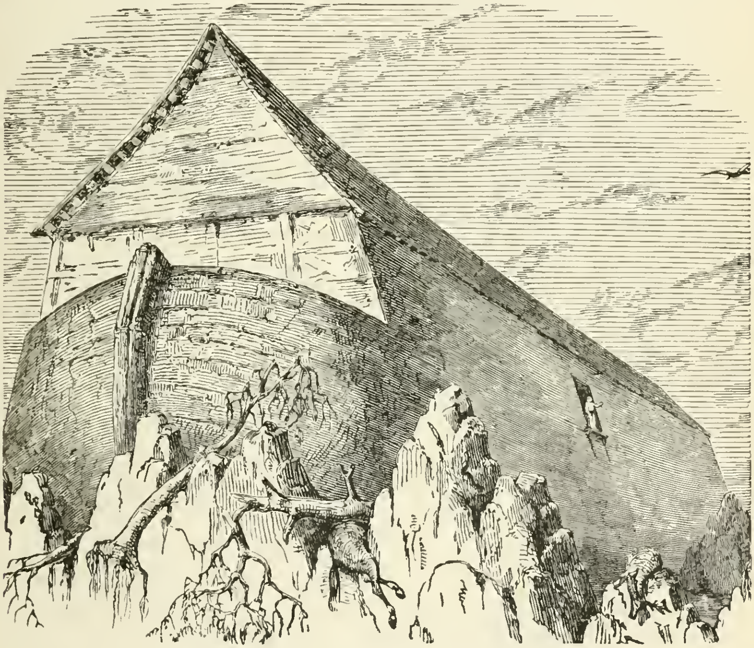
Ararat, strictly speaking, is the name given to a mountainous district of Asia Minor, in the province of Armenia, which has acquired a peculiar interest from its connection with the Scriptural records of the Deluge. It was unknown to the ancient geographers, as it is to the modern Armenians; but evidence exists to prove that it was an old and indigenous name for a portion of Armenia,—and it seems to have been applied to the elevated table-land which overlooks the plain of the Araxes on the north, and of Mesopotamia on the south. At a very early date this table-land was put forward as the spot where the ark rested after the subsidence of the Noachian Flood. Tradition's finger still points to the Jebel Judi as the scene of the event, and legends record that fragments of the ark still lie upon its lonely summit. And, indeed, it was only natural that the Ararat range should be selected by an inhabitant of the Mesopotamian plain, to whom it must have represented the world's furthest limit, or at least its loftiest summits.

In this neighborhood, at all events, are all the associations and traditions connected with Noah, and European travelers have confirmed the opinion of the natives so far as to confine the name Ararat to the loftiest and most striking mountain in the district. Ararat, then, as it is now called, starts immediately from the plain of the Araxes, and terminates in two conical summits, the Great and the Less Ararat, about seven miles distant from each other; the former attaining an elevation of seventeen thousand feet above the sea-level, while the latter is about four thousand feet lower. The crest of the former is shrouded in eternal snow. Its middle region abounds in immense masses of cinders, lava, and porphyry, indicating the volcanic origin of the mountain; and a chasm on its northern side has been regarded as a crater. In July, 1840, it was the scene of an outbreak, in which the village of Arguri and the monastery of St. James were destroyed. A violent earthquake brought down an avalanche of earth and stones from the upper heights, which buried beneath its ruins both the convent and the village. As


THE HISTORIC MOUNT ARARAT.

the shock was followed by clouds of reddish smoke and a pungent sulphurous odor, it is assumed that the volcanic forces of Ararat are not extinct, and without any doubt this conjecture is well founded.

It was long believed that the summit of Ararat was inaccessible, and the Armenians still adhere to the belief, though its ascent was accomplished in 1829 by Parrot, and several later travelers have successfully followed in his footsteps. The region immediately below the snow-line they describe as bare and desolate, unvisited by beast or bird, and haunted by a silence and a solitude which are completely overpowering. Arguri, the only village known to have been erected on its slopes, was the spot where, according to an ancient tradition, Noah planted his vineyard; and in the plain of the Araxes, the patriarch is reputed to have been buried. One of the legends connected with Ararat relates that, in the early ages of Christianity, a poor monk conceived the idea of offering his prayers on the sacred summit, and thrice attempted the ascent, but was thrice brought back by angels to his starting-point, where he was ordered to build the chapel destroyed along with the village of Arguri in 1840.



NOAH'S ARK RESTING ON ARARAT.

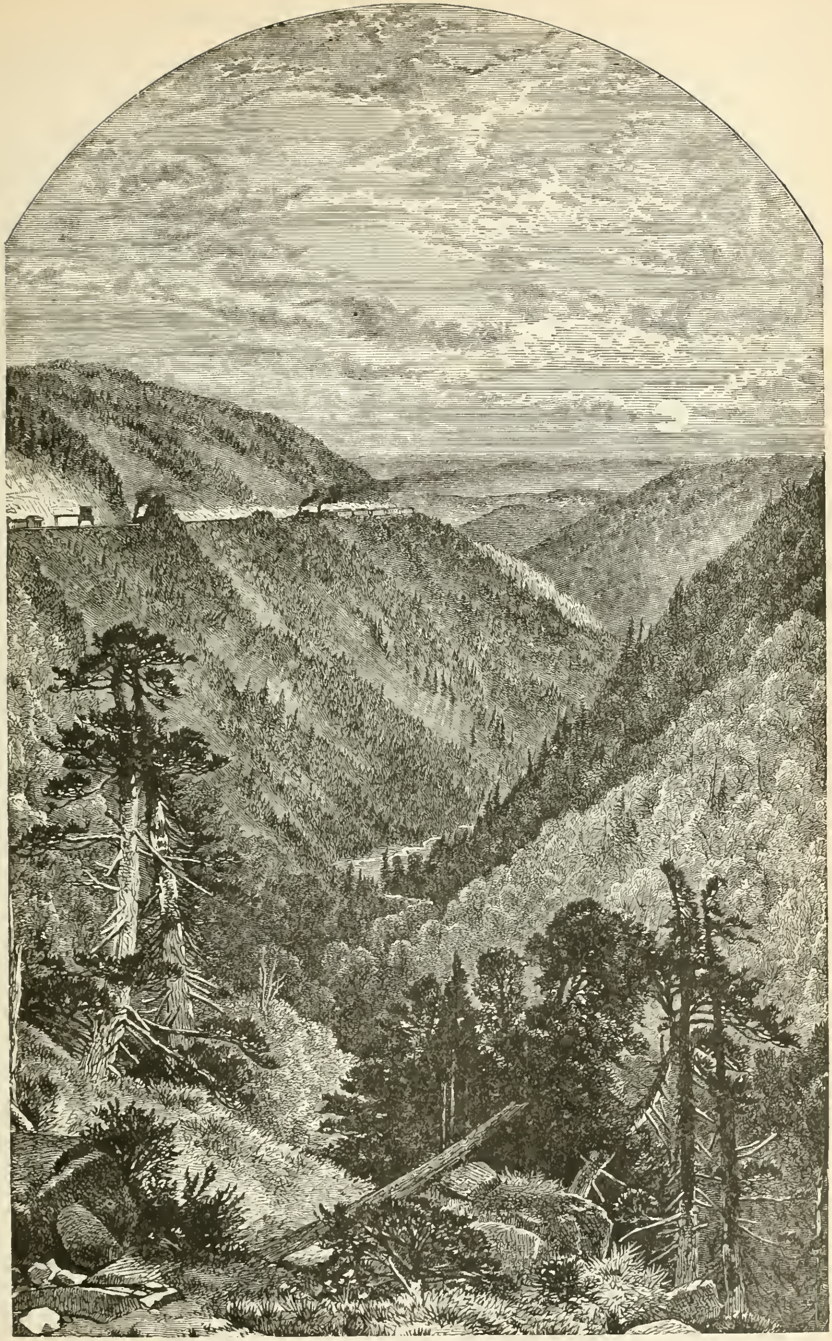
The Island of Mauritius, in the Indian Ocean, possesses a chain of mountains of volcanic origin, some of which are singularly striking and rugged in appearance. The most celebrated of these, and one that, from its peculiar formation, is one of the most wonderful mountains of the world, is known as the Pieter of Peter Botte, after the name of an adventurous Dutchman who, tradition asserts, once scaled its summit, but lost his life in coming down. In form it is a rugged cone, which runs up sharply from its base to the height of nearly three thousand feet; and at the summit of this cone is a huge mass of rock, which appeared to be poised with the greatest nicety, so that a change in its direction of a few feet on either side would bring it to the earth.

The example of the unfortunate Dutchman was not sufficient to deter other daring spirits from making the same attempt, and several times the mountain has been ascended in safety. The first instance occurred in 1832, when a party of Englishmen accomplished what was then deemed a most daring and hazardous task. An idea of the difficulty of the undertaking, as well as the general character of the mountain, will be gained from the following narration by one of the party.

A FRIGHTFUL CLIMB TO THE PINNACLE.

On rising to the shoulder of the mountain, a view burst upon us which quite defies my descriptive powers. We stood on a narrow ledge or neck of land about twenty yards in length. On the side which we mounted, we looked back into the deep wooded gorge we had passed up; while on the opposite side of the neck, which was between six and seven feet broad, the precipice went sheer down one thousand five hundred feet to the plain. One extremity of the neck was equally precipitous, and the other was bounded by what to me was the most magnificent sight I ever saw. A narrow knife-like edge of rock, broken here and there by precipitous faces, ran up in a conical form, and on the very pinnacle old "Peter Botte" frowned in all his glory.

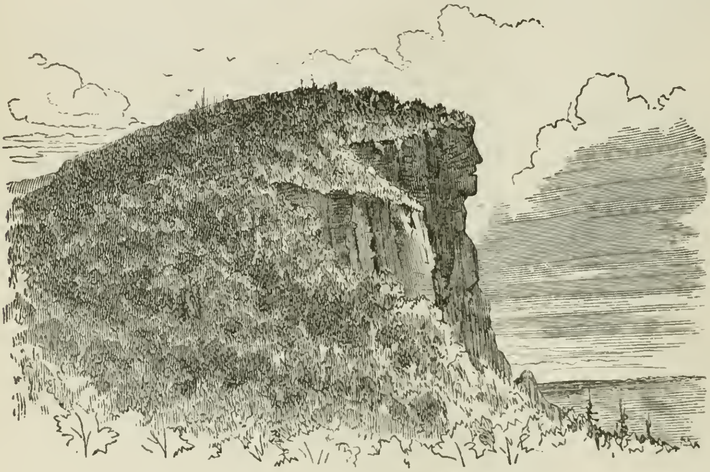
After a short rest we proceeded to work. A ladder had been left by a party who attempted the ascent the year before. It was about twelve feet high, and reached about half way up a face of perpendicular rock. The foot, which was spiked, rested on a ledge, with barely three inches on each side. A negro clambered from the top of the ladder, by the cleft in the face of the rock; he carried a small chord round his middle. A single loose stone or false hold must have sent him down into the abyss; however, he fearlessly scrambled away, till at length we heard him halloo from under the neck, "All right!" The line carried up he made fast above, and up it we all four "shinned" in succession. It was, joking apart, awful work. In several places the ridge ran to an edge not a foot broad; and I could, as I held on half sitting, half kneeling across the ridge, have kicked my right shoe down to the plain on one side, and my left into the bottom of the ravine on



A MAGNIFICENT SCENE IN THE WHITE MOUNTAINS.

the other. I held on uncommonly hard, and felt very well satisfied when I was safe under the neck.

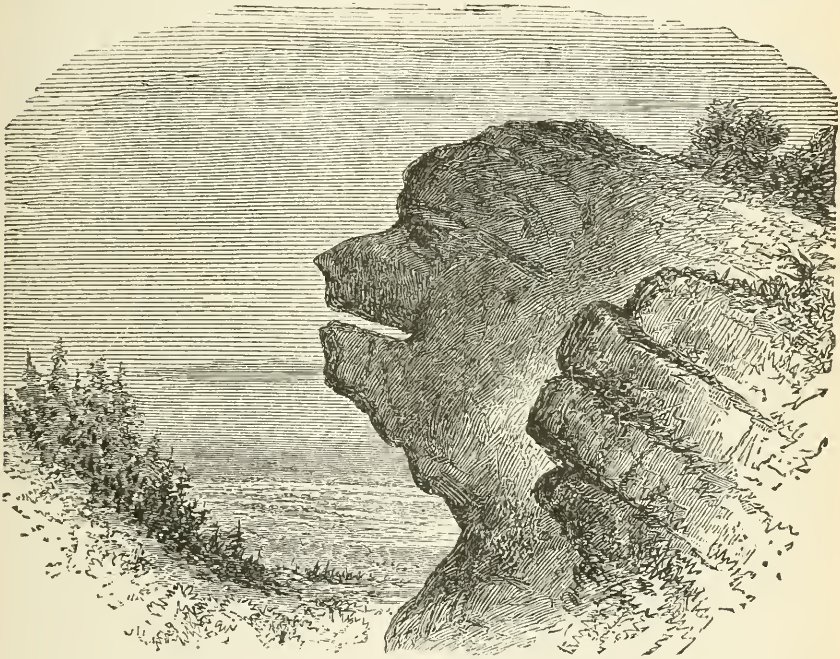
A communication being established with the shoulder by a double line of ropes, we proceeded to get up the necessary material—the portable ladder, additional coils of ropes, and crowbars. But now the question was how to get the ladder up against the rock. One made a line fast round his body, to which we all held on, and going to the edge of the precipice on the opposite side, he flung a large stone with a lead-line over the least projecting part, and it was eagerly seized on the opposite side. Three lengths of the ladder were put together on the ledge; a large line was attached to the one which was over the head, and carefully drawn up; and, finally, a two-inch rope, to the extremity of which we lashed the top of our ladder, then lowered it gently over the precipice until it hung perpendicularly, and was steadied by two negroes on the ridge below. "All right, now hoist away!" And up went the ladder till the foot came to the edge of our ledge, where it was lashed in firmly to the neck. We then hauled away on the guy to steady it, and made it fast; a line was passed over by the lead-line to hold on, and up went the one who had held the line, screeching and hallooing, and we all three scrambled after him. The Union Jack and a boat-hook were passed up, and the flag waved freely and gallantly on the redoubted Peter Botte.



THE OLD MAN OF THE MOUNTAIN.

A sketch of the wonderful mountains of the world would be incomplete without a description of some in our own country, which are justly celebrated for their unsurpassed grandeur. America is the land of the marvelous. It is affluent in nature's magnificence, and if the countries of the Eastern Hemisphere can present sights which are worth visiting, even at the expense of thousands of miles of travel, we can furnish marvels and attractions no less worthy of admiration. Here may be witnessed on the grandest scale the varied wonders of natural scenery.

The Atlantic system of mountains extends from Newfoundland to Alabama. Along this picturesque chain, as it extends through New England, are many bold summits, which have been explored by enterprising scientists, and are now visited by crowds of summer tourists, who are attracted by the splendid scenery and the invigorating mountain air. The White Mountains form a part of this range, and are justly celebrated for their imposing features and the magnificent views to be obtained from their elevated heights, which attract so many visitors.



THE CURIOUS LAUGHING HEAD, ARKANSAS.

There are two clusters of peaks which are separated from each other by a table-land from ten to fifteen miles in width. The highest of these is Mount Washington, which is the loftiest mountain summit in New England, being six thousand two hundred and ninety-three feet above the level of the sea. This, with many of the surrounding peaks, is composed of immense masses of bald and rugged granite. A gravelly soil, formed around the bases of these barren summits, supports a few hardy trees, such as are capable of growing in the poorest ground.

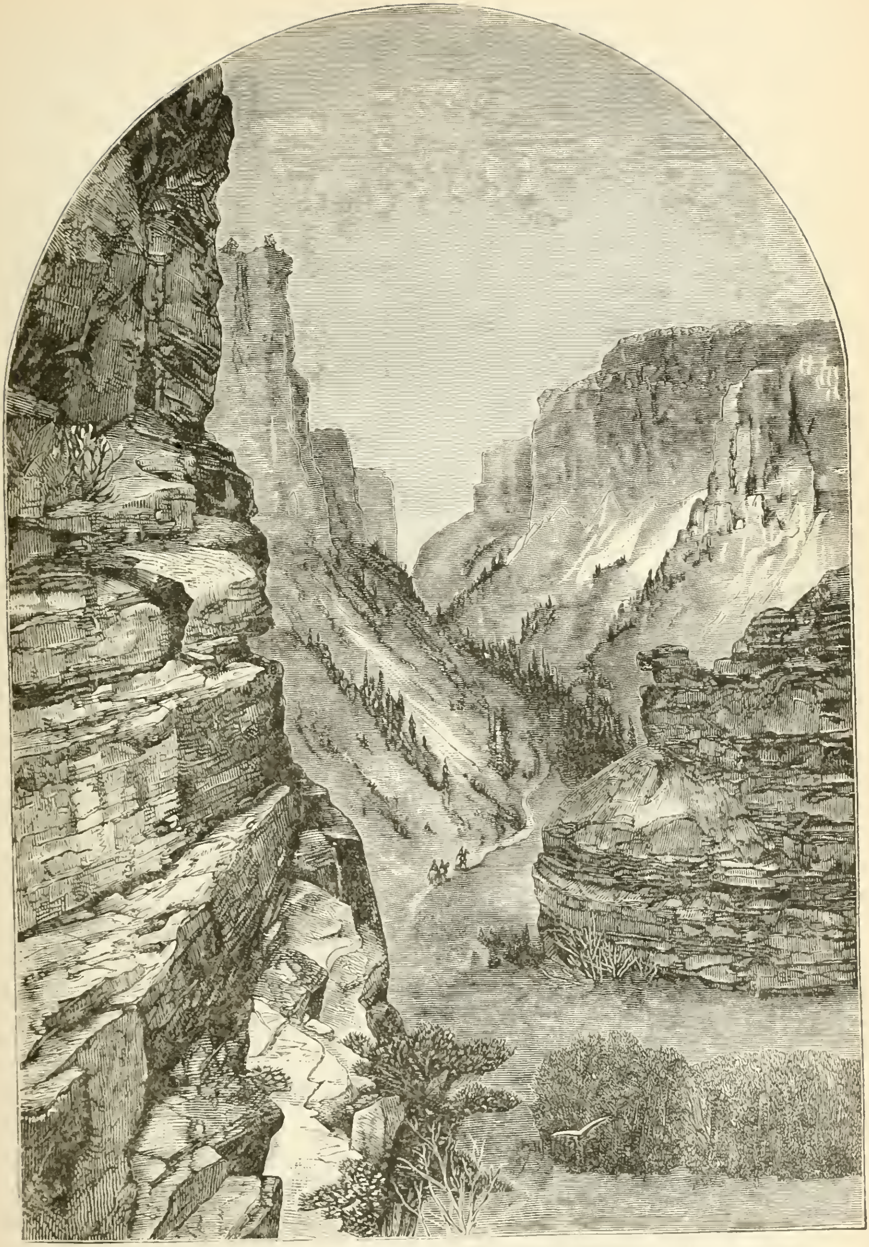
A near approach to Mount Washington can be made by railway, and in addition to this a carriage road on the east side enables the traveler to reach the highest point. Here may be seen other peaks far below, gulches through which dashing streams flow, valleys further away that are traversed by rivers, and at times such brilliant sunsets and landscape expanses as awaken the admiration of every beholder. Among other objects of interest is the "Old Man of the Mountain," in the Franconia group, opposite Mount Lafayette. It is a remarkable profile of a human face, eighty feet in length, and formed by the singular grouping of three immense, projecting rocks.

From one peak you may obtain a view extending beyond a deep mountain gorge lying far below, to a summit opposite, around which winds the railroad, requiring two engines for the ascent when several cars compose the train. Toward evening the descending sun lights up this scene, and gives it a rare beauty and sublimity.

In many parts of our Great West there are mountainous formations which cannot be classed as anything other than curiosities. They are remarkable not merely for size, but in many instances for shape and configuration. In Arkansas there is a Laughing Head that is worth noting. From one point on the Arkansas River the traveler who looks at Dardanelle Rock, a part of Magazine Mountain, that juts out opposite Norristown, in Pope County, will see a grotesque face, with wide open mouth, as if laughing, and even the semblance of an eye.

The southern section of the Rocky Mountains comprised in Southern Wyoming, Colorado, and New Mexico, contains the greatest mass of elevation. Here are ranges extending for hundreds of miles, whose crests are surmounted by lines of peaks towering far into the sky. Proceeding westward from the western border of the plains, we cross a succession of two, three, or more well-defined ranges, beyond which are scattered groups of mountains apparently without system. There is a great contrast in this respect between the eastern and western sides of the system. On the east the plains are bordered by well-defined ranges, whose crests are sharply cut; while on the west the mountain-making forces seem to have expended themselves in throwing up groups more or less isolated.

The Parks of Colorado are large high mountain valleys, on the very crest of the Cordilleran plateau. They are four in number. The first of these lies partly in Southern Wyoming, the Colorado boundary passing through it near the middle. It has an area of about seven hundred square miles. Its surface is quite flat, well grassed, and abounding in large game. On all sides rise high mountains, forming an almost continuous wall around the valley. It is drained by the North Platte



IMMENSE MOUNTAIN CLIFFS, SOUTHERN WYOMING.

River. North of the North Park, and separated from it by high mountains, are the Plains of Laramie, lying west of the Laramie Range. They are fertile and grass-covered, and afford pasturage to vast herds of cattle, and, in the spring and fall, to countless bands of antelope. South of North Park, separated from it by detached peaks of volcanic origin, is the depression known as Middle Park. It is a collection of narrow valleys, separated from one another by high ranges, spurs from the walls of the Park. In this depression heads the Grand River, a fork of the Colorado. The next in this meridional series is the South Park. This is a table-land, very uniform in surface, with the exception of a few minor ridges, and in the southern part numerous volcanic buttes. Its shape is nearly elliptical, its longest axis being nearly north and south. Its limits are sharply defined by the surrounding mountains, which rise abruptly on all sides to the highest summits. It is drained by the South Platte and its branches. Its surface is covered with the highly nutritious bunch grass, which makes it an excellent pasture-land, a thing which stock raisers quickly discovered.

One of the most important groups in the Rocky Mountain Range is that known as the Elk Mountains. These mountains are of volcanic origin. Some of the peaks are of volcanic material, readily distinguished from those of sedimentary material by their light-gray, almost white, color, while the others are a vivid red, brown or maroon. In sharp contrast with the heavy massive forms of those ranges heretofore considered are the spires and pinnacles of these catastrophic mountains. In the eastern members the peaks reach nearly as great an altitude as in the Sawatch, but toward the west they are much lower, and with their disappearance the system of plateaus and mesas of the region of the Colorado begins. From the south end of the Sawatch Range a mass of hills runs south-westward, connecting with an enormous mass of mountains about the heads of the Rio Grande, the Rio San Juan, and many branches of the Gunnison. They can be defined only as a mass, with a long spur, of magnitude amply sufficient to entitle it to the name of range, running southward, and forming the western wall of the San Luis Valley. This mass radiates drainage in all directions. Within these mountains there is no level country, practically. The largest valley, known as Baker's Park, is but four miles long by half a mile in width. South of this group, in New Mexico, the level of the plateaus is broken by several ranges of greater or less magnitude.

CHAPTER XIV.

WONDERS OF THE ATMOSPHERE.

A Storehouse of the Marvelous—No Such Thing as Cold—Beautiful Vapor Crystals—Gorgeous Pictures of the Sun—The Wonderful Mirage—Striking Effects of Frost—Aerial Navigation—The Great Voyage Across Europe—A World Far Below—The Balloon in Warfare—Despatch from a Balloon to President Lincoln—The Dreadful Cyclone—Theory of the Whirlwind—Trade Winds—Snow and Rain in Colors—A Rain of Ink—Marvelous Showers of Dust and Fishes—Brilliant Sunsets—The Barometer and Thermometer—Men Who Thought They Could Fly.

NOT only is the atmosphere, by which the earth is enveloped, the great source of life to the animal creation, but it is a vast museum and a storehouse of the marvelous. Its phenomena as exhibited in cold and heat, the frost that chills the vapor and the sunbeams that warm the world, and displayed also in the discoveries of balloonists, are of the most interesting and remarkable description. The atmosphere is the medium of light and warmth from the sun. It shows us the falling snow with its crystal shapes, the golden dawn and flaming sunset, the worlds that hang their lamps in the firmament and the beautiful rainbow that flings its gorgeous arch across the sky.

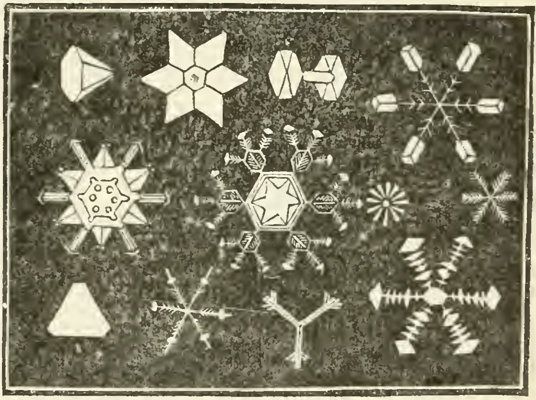
Every one knows that there is no such separate existence as "cold." Cold is only an absence of heat; hence, when we require great cold, we must use some body which is demanding large quantities of heat. The confectioners apply this principle in making ices. The creamy preparation, placed in a metallic vessel, is immersed in broken ice mixed with salt. Now it happens that, for some unknown reason, salt and ice so act upon each other as to force the ice to liquefy, but this it is unable to do unless it has heat: this it abstracts from the cream, which consequently freezes. Two parts of pounded ice mixed with one of common salt can reduce the temperature thirty-six degrees below the freezing-point of water; or if, instead of the salt, three parts of crystallized chloride of lime be used, so low a temperature is produced that mercury will freeze. Yet, low as we can get the temperature by these freezing mixtures, it is nothing to the wonderful degree of intense cold which the vaporization of some liquids can produce.

There is every reason to believe that gases are in reality liquids in vapor. Many of them, by being forced into a wrought iron receiver by means of a forcing pump, can be liquefied. Of course, when the liquid is taken out of the receiver, and relieved of the enormous pressure under which it existed, it immediately endeavors to go back to its gaseous state. It is in a tremendous hurry to do this, and, seeing it is unable to become a vapor without it receives a large increase of heat, it commands all the surrounding bodies to deliver up their heat in the most peremptory manner. Laughing-gas, or nitrous oxide, so condensed under a pressure of four hundred and fifty pounds on every square inch of the receiver which held the gas, and then liberated, can produce a temperature by its rapid evaporation nearly two hundred degrees below the freezing-point of water; and, by causing this process to go on under the exhausted receiver of an air-pump, the greatest cold has been produced—very nearly three hundred degrees below the temperature of ice.

But perhaps a more remarkable fact is this: that it is possible to cause extremes of temperature to exist in the closest juxtaposition. If some of the liquefied gas above mentioned be placed in a red-hot platinum crucible, and then a little water dropped on it, the water will go into ice. Imagine freezing in a red-hot crucible! nay, even mercury can be made to take the solid state under similar circumstances, and frozen mercury is so cold that when held in the hand it will blister it as though it had been a piece of red-hot iron. The reason that the liquefied gas was not instantly dissipated by the heat is the same as that which causes a drop of water to dance about on an almost red-hot plate of metal: the drop does not really touch the plate, but is surrounded by an atmosphere of vapor, upon a thin layer of which it rests. An ingenious application of this really wonderful fact has been long in use in glass-works. The mode of making plate-glass is to blow a cylinder of glass, then cut it open and spread it out. To make the cylinder even and symmetrical, the glass is blown in a wooden mould, the sides of which are wet with water; the red-hot glass converts this into steam, which keeps the glass from burning the wood, and also from touching the water, which would at once spoil it, rendering it brittle.

If possible, more wonderful, and indeed, all but incredible, is the finding of ice over which a lava-bed has been poured centuries ago. The ice was first covered with a layer of cinders, which are bad conductors of heat; then came the molten lava; and the non-conducting power of the ashes proved sufficient to prevent the heat of the lava from melting the ice. This is an occurrence by no means rare.

The ancient historian Herodotus tells us, in his gossiping way, that the Scythians reported of the country lying beyond them, and further to the north, that it could neither be passed, nor yet discerned with the eye, on account of the feathers which were continually falling. With these both the earth and the air were so filled as effectually to obstruct the view. He had himself sufficient acquaintance with natural phenomena to conjecture that by feathers the wild inhabitants of Scythia in reality meant snow; but it is more than probable that when the uninformed denizens of warmer latitudes first gazed, in their travels, on the spectacle of a snow-storm, they verily believed, and reported in all honesty, that feathers had been falling to the ground. The nursery story of the "old woman picking her geese" may thus have had its counterpart in the infantile ages of the life of the human race. Snow is always a wonder to him who sees it for the first time, and, familiar as it is to us, we occasionally meet with people to whom it is utterly strange. Youths born in India, for example, gaze upon a snow-fall with astonishment and admiration.


WONDERFUL SNOW CRYSTALS.

But there are wonders in the snow, with which many who look upon its coming as quite a matter of course, may be unacquainted. Such a wonder is presented in the phenomena of crystallization. Snow is produced by the freezing of moist vapors suspended in the atmosphere; and in very low temperatures the flakes or particles of snow are found to assume the most elegant and regular forms. These, from their perfect geometrical proportion, are denominated crystals, that name being applied to all particles of matter which take a definite geometrical shape. Snow crystals are of infinite variety and beauty. Captain Scoresby, the Arctic traveler, who was the first to observe them, gave ninety-six illustrations of their graceful forms, in his description of the Arctic regions.

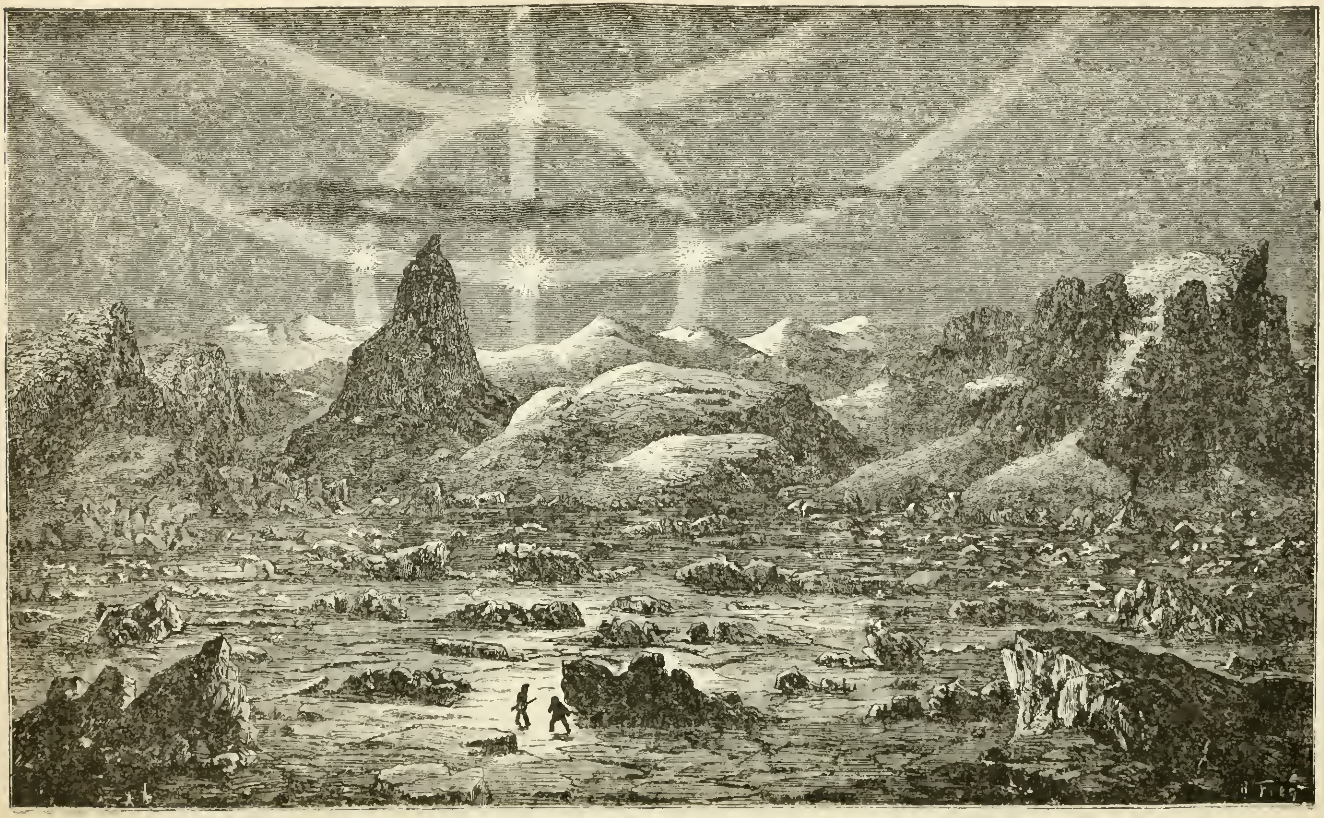
It was at first thought that only such extreme cold as that of the Arctic regions could produce this crystallization. On investigation, however, it was discovered that in our own severe winters the snow presents an equally wonderful appearance; and an eminent meteorologist has given to the world a representation of one hundred and fifty figures from the snow, which had come within his own observation. These were quite as beautiful and diversified in character as those noticed in the Polar seas.

One striking feature in the snow crystals is this: that though differing so widely in character, they are all, or nearly all, hexagonal or six-sided in shape. Occasionally three-sided figures are seen, but these are very rare. Sometimes three of the sides are shorter than the other three, so that the figure is like a triangle with the points cut off; and now and then two small figures are connected together by a slender bar or link. As a rule, however, the hexagons consist of thin plates shaped like beautiful stars, and sometimes surrounded by other stars of similar nature. The great variety of these appearances is apparently inexhaustible, for each investigation has resulted in the discovery of forms previously unobserved, although possessing the general characteristics to which we have alluded. The angle of sixty degrees is also found to prevail in all the various ramifications of these stars amid the snow, in conformity with the law by which water always crystallizes at this angle. Thus there are constellations in the flying snow.

BRILLIANT PICTURES OF THE SUN.

The intensity of the colors of the rainbow has been found to depend in a great measure on the size of the drops of water from which it forms itself. When a rainbow is seen in a fog, the colors of it are always remarkably faint, owing to the minuteness of the drops of water on which the sun's rays fall; so, on the other hand, when we see a rainbow following, as it were, in the wake of a pelting April shower, we are always struck with the vividness and intensity of its hues. The remarkable appearance represented in the illustration is a very peculiar rainbow which was observed by Ulloa and Bouguer during their stay in the Pichincha, and called by them, from the singular faintness of its tints, the white rainbow. It is also known as Ulloa's circle, from the name of one of the travelers who witnessed it.

Ulloa was with his fellow-travelers, one morning at day-break, on the summit of the Pambamarca. The whole of the mountain-top was covered with a dense fog, which gradually dispersed as the sun rose. By degrees the atmosphere became tolerably clear, with the exception of a few light vaporous clouds, so filmy as to be scarcely perceptible. While they were noticing these gradually disappear, one of the travelers, on turning round suddenly to that quarter of the sky which was exactly opposite to the rising sun, perceived an image of himself reflected in the air as distinctly as in a mirror, and standing, apparently, at about the distance of twelve feet from him. The figure appeared to stand in the centre of three concentric rings, which were shaded with different colors, while around the whole was a fourth ring, tinted with one color alone. The outermost edge of each of the three interior rings was crimson, the next color was orange, which shaded



MARVELOUS MOCK SUNS—THE LUMINARY PAINTED ON MIST.

off through yellow into a pale straw, while the innermost tint was green. The figure, with the surrounding rings, followed every movement of the observer, the rings always keeping the figure in their centre. The atmosphere is a storehouse of vivid colors.

Another very singular atmospheric effect is produced by the rays of the sun, and sometimes those of the moon, striking, not upon drops of water, but upon minute crystals of ice. Clouds formed of such crystals are stated by aeronauts to exist in the highest regions of the atmosphere, where they constitute those clouds which are known among meteorologists by the name of cirrus. The most frequent phenomena of this kind seen in temperate climes are what are called halos, such as we so often see round the moon on a slightly misty night. The circular rings of light are divided by luminous diameters. On these lines, a little outside each circle, brilliant patches of light are seen to form, which are called mock suns or mock moons, according as the sun or moon happens to be the centre of light. Those just outside the inner circle are beautifully colored with the different hues of the prism, while those altogether outside are nearly colorless. Frequently, also, arcs of circles are seen touching the principal halos, and these, especially at the point of contact, are brilliantly colored. These are most perfect round the inner circle; when they are seen touching the outside one they are usually faint and indistinct.

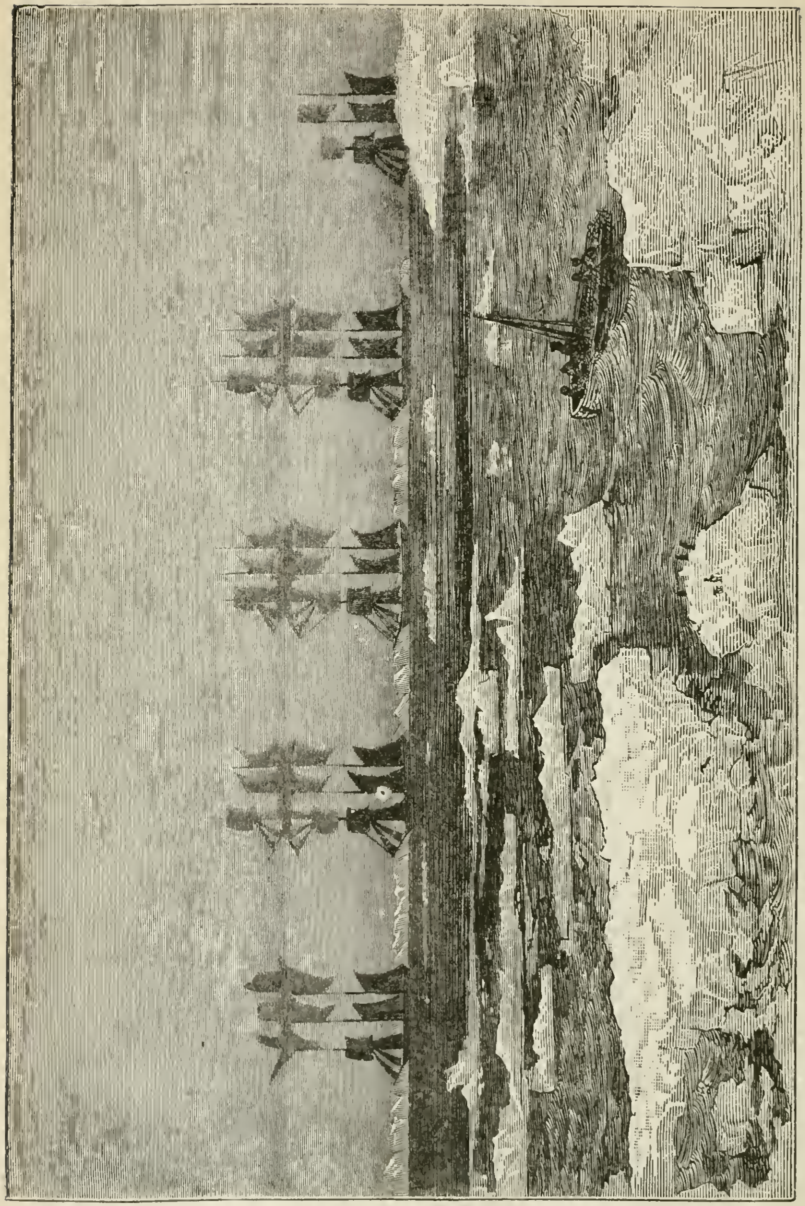
AMAZING SPECTRAL ILLUSIONS.

The beautiful, deceptive phenomenon known as the mirage is of three distinct kinds. First, there is that form of it where some distant object, below the line of the horizon, and consequently out of the range of vision, seems to be lifted up into mid-air, and to hang suspended there —sometimes in its natural position, sometimes upside down, and sometimes both ways at once; the image in this latter case being doubled, like a ship and its reflection in the water. Secondly, there is that form of it where some object high up in the air, such as a cloud or a village on a hill, seems to be brought down and to lie floating in a vast lake stretching miles away at the spectator's feet. Thirdly, there is that less frequent form of it, where the setting sun appears to fling huge shadows of terrestrial objects far out into space.

Of the first kind of mirage there are some very striking instances on record. While sailing in the Polar seas, Captain Scoresby saw the inverted image of a ship, apparently suspended in the air, some miles distant. It was, he writes, so well defined that I could distinguish by a telescope every sail, the general rig of the ship, and its particular character, insomuch that I pronounced it to be my father's ship, which it afterwards proved to be; though on comparing notes with my father when we met, I found that our relative position at the time gave our distance from one another very nearly thirty miles, being about seventeen miles beyond the horizon, and some leagues beyond the limit of direct vision. An English ship, while cruising in the Baltic, saw a similar mirage of the whole British fleet, consisting of nineteen sail. Here, again, the distance between the vessels was found to be full thirty miles. In both these instances the objects seen were inverted. At Hastings, on the south coast of England, a more striking example of mirage was witnessed. The whole of the coast of France, from Calais to Dieppe, though more than fifty miles distant, and quite out of the range of ordinary vision, seemed to be lifted up into mid-air, and was seen there, not inverted, but in its natural position, during the space of three hours, by hundreds of persons assembled upon the beach. The most remarkable instance of all, however, is that from Ramsgate, the four turrets of Dover Castle may be seen on a fine day over the top of an intervening hill. While looking in this direction one evening, the whole castle was seen, not lifted up in the air above the hill on the other side, but to all appearances brought over bodily on this side of it. So strong was the image, that the hill could not be seen through it. The double mirage is seen oftenest on the shore of the Straits of Messina, where the phenomenon is known as the Fata Morgana. The images of men, horses, houses and ships are projected into the air, feet to feet, or keel to keel, as the case may be, until the atmosphere looks like one huge lake, in which all these miscellaneous objects are seen floating about together.

The second kind of mirage—that, namely, in which the object is brought down instead of being elevated—is most frequently seen in the arid deserts of Lower Egypt, where it often proves cruelly deceptive to the thirsty traveler. Dotted about the waste are elevations, on which the natives have built their villages, in order that they may be safe from the flood during the periodical inundations of the Nile. In the heat of the day, the mirage brings down an image of the sky upon the level, some few miles in front of the caravan, and produces the effect of a broad expanse of water, in which each village, brought down also, appears as an islet. Lured on by the refreshing prospect, man and beast push hopefully forward, often miles out of their track, to find the waters and the islands constantly receding from their view, until the evening comes, and they vanish altogether. So complete is the delusion, that not only experienced and scientific travelers, but even the Arabs themselves, are often deceived by it.

To produce the third illusion, the observer must be above the level of the reflecting surface. A stratum of denser air being above the



AN EXTRAORDINARY SPECTACLE IN THE ARCTIC REGIONS.

eye, as is sometimes the case at sea, then a phenomenon, such as the reflection of a steamer, is caused. The reader will readily conceive the philosophy of this, if a plate of glass be imagined to exist parallel to the surface of the sea at the height of the reflected ship. Thus we should see the vessel upside down, and the stratum of denser air has precisely the same effect.

The double reflection of the three-masted ship is somewhat more complicated. The vessel itself is almost below the horizon, and, indeed, the reflection in the sky of a ship thirty or forty miles distant has been seen. This certainly is one of the marvels of human vision.

The inverted reflection is due to the same cause as that of the steamer. In each of these cases, as in all cases of reflection, only some of the rays of light were reflected or thrown back from the surface—the rest passing into the upper stratum ; and if we could have risen in a balloon, in all probability we should have been able to reach these rays, and thus have seen the other image of the steamer upright, and keel to keel with the inverted image. In the case of this ship, the reflecting surface happens to be in the right position for the observer not only to catch the first reflection, but the rays which entered the upper layer are refracted, or bent down, and thus the second image becomes visible.

STRANGE VISIONS IN THE DESERT.

Eastern travelers often tell scarcely credible tales of the mirage of the desert. Suddenly in the distance, where all is known to be arid sand, appears a sheet of water. Here and there upon its bosom lie enchanted islands, above the top of whose woody groves rise the turrets of castles, or minarets of mosques. So real is the sight, that men and camels push forward, longing to bathe in the refreshing waters of this fairy lake ; but as they advance, the mirage retreats, and all fades as the sun sinks beneath the lurid horizon. The explanation of the phenomenon is this : that the sand, being intensely hot, causes the layer of air which rests upon it to become greatly rarefied ; and under certain circumstances this layer is quite distinct from the denser stratum a few inches or feet above it—just as if it were a sheet of water upon which oil rested, the surface at which the two layers meet being quite sharply defined.

This explanation will, in some measure, account for that illusion which is occasionally seen on the Straits of Messina. The Italians called it the Fata Morgana. It is thus described by one who was fortunate enough to witness it : As I stood at my window, I was surprised with a most wonderful delectable vision. The sea that washes the Sicilian shore swelled up for the distance of ten miles, like a chain of dark mountains ; while the waters near the Calabrian shore grew quite smooth, and, in an instant, appeared as one clear, polished mirror, reclining against the aforesaid ridge. On this glass was depicted a string of several thousands of pilasters, all equal in altitude, distance and degree of light and shade. In a moment they lost half their height, and bent into arcades like Roman acqueducts. A long cornice was next formed on the top, and above it rose castles innumerable, all perfectly alike. These soon split into towers, which were shortly after lost in colonnades, and, at last, ended in pines, cypresses, and other trees, even and similar. This was the Fata Morgana, which for twenty-six years I had thought a mere fable, but found to be a picturesque and pleasing reality.

STARTLING EFFECTS OF FROST.

During one of Franklin's voyages, the winter was so severe, near the Coppermine River, that the fish froze as they were taken out of the nets; in a short time they became as solid as ice, and were easily split open by a blow from a hatchet. If, in the completely frozen state, they were thawed before the fire, they revived. This is a very remarkable instance of how completely animation is sometimes found suspended in the case of cold-blooded animals. The common leech is said to be capable of resisting the effects of a low temperature to a wonderful degree. It is said that once a group of these animals left accidentally in a closet without a fire, during the severe frost of the year 1816, not only survived, but seemed to have experienced no injury, although they had been imbedded in a solid mass of ice for many days.

A celebrated Arctic traveler states that all animal substances, fish excepted, may be preserved in Greenland for any length of time without being smoked, dried or salted. Beef, mutton, pork and fowls, the latter neither plucked nor drawn, are constantly taken out from the northern islands of Scotland, and preserved in this way. When used, the beef is divided by a saw; it is then thawed in cold water, and if cooked when it is three, four or five months old, will frequently appear as profuse of gravy as if it had been recently killed. A further antiseptical effect is produced by the cold on animal and vegetable substances, so as to preserve them, if they remain in the same climate, unchanged for many years. Wood has been met with in Spitzbergen which has resisted all injury from the weather during the lapse of a century. A French writer relates also that the bodies of seven Dutch seamen, who perished in Spitzbergen in 1635, were found twenty years afterwards by some sailors who happened to land about the place where they were interred, in a perfect state, not having suffered the smallest degree of putrefaction. A similar phenomenon is recorded of the Mer de Glace in Switzerland, which engulfed several travelers, and many years afterward threw their bodies out in the valley below; the natural movement of the ice having carried them down. When water solidifies, or freezes, it expands, and for this reason water-jugs and bottles, as well as the leaden supply-pipes, are often broken in severe weather by the formation of ice within them. The water in the vessel freezes at the top. No injury is done because there is nothing to hinder the expansion upwards. But if it freezes again, until the ice becomes so thick that it is more capable of resisting the expansive force than the glass or earthenware of which the vessel is composed, the latter will break. An artillery officer at Quebec made an experiment during a hard winter, by filling a bomb-shell, about fourteen inches in diameter, with water, and then closing the opening with an iron peg, which was driven firmly in. This being exposed to the severe frost, the stopper was driven out to a distance of more than one hundred yards, and a cylinder of ice, eight or nine inches long, came out of the opening. In a second experiment of the same kind, the stopper resisted the expansive force; but the shell itself was rent, and a ring of ice was forced through the crack all round the shell. In the same manner houses have been overthrown by the expansive force of frost in the earth causing the ground to swell up. Stones will break in consequence of the water they contain freezing, and trees have split up with an explosive sound on occasions of sudden cold occurring when their vessels have been full of sap.

An interesting experiment on the expansion of ice was made in Maine not long ago. The Kennebec River, near the town of Gardiner, is about seven hundred feet wide; the water is very fresh for many miles below, and the average ebb and flow of the tide is five feet; the depth of the water varies, according to the locality and state of the tide, from seventeen to twenty-five feet. In the course of the winter, the ice is always observed to crowd ashore, crumpling up in ridges on the flats, and near the edge of the channel. A row of stakes was planted in the ice, by boring holes through to the water, at distances of about one hundred feet apart, avoiding a very near approach to the shore. The distance between the eastern and western stakes was five hundred feet. A month later it was found that the outer stakes had advanced more than a foot, and the whole expansion was upwards of thirteen feet. The balloonist also meets with singular atmospheric facts.

WONDERFUL AERIAL VOYAGES.

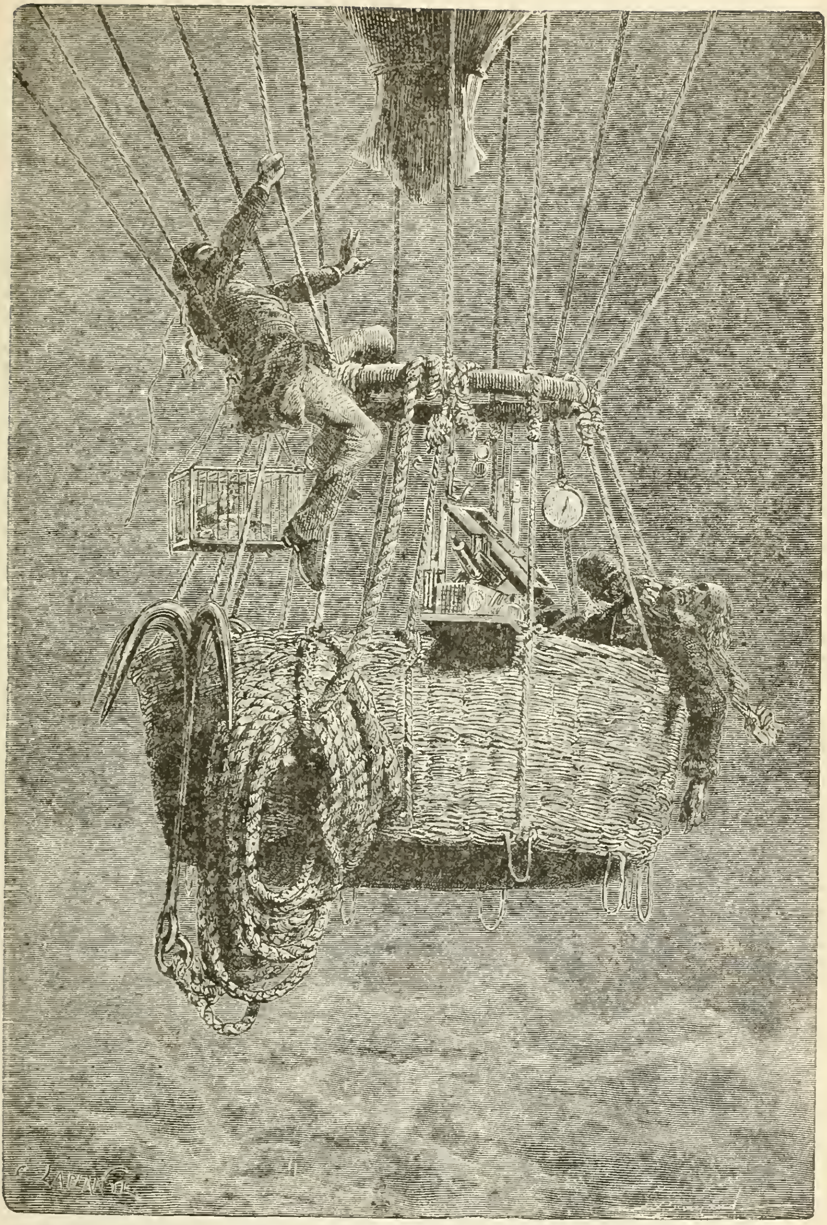
The first balloon of Montgolfier, the discoverer of ballooning, was small, containing less than seventy-eight cubic inches of air. He made it rise to the roof of his apartment, in November, 1782. Certain, then, of the new principle, he made a balloon of considerable size, containing upwards of sixty-five feet of heated air. This machine likewise rose, tore away the cords by which it was at first held down and mounting in the air to the height of from two to three hundred feet, fell upon the neighboring hills after a considerable flight. The brothers Montgolfier then made a very large and strong balloon, with which they wished to bring their discovery before the public.

On the appointed day, the nobility of the vicinity were invited to be present at the experiment. What was the general astonisment when the inventors of the machine announced that immediately it should be full of gas, which they had the means of producing at will by the most simple process, it would raise itself to the clouds! It must be granted that, in spite of the confidence in the ingenuity and experience of the Montgolfiers, this feat seemed so incredible to those who came to witness it, that the persons who knew most about it—who were, at the same time, the most favorably predisposed in its favor—doubted of its success. But the machine—which at first seemed only a covering of cloth, lined with paper, a sort of sack thirty-five feet high—became inflated, and grew large even under the eyes of the spectator, took consistence, assumed a beautiful form, stretched itself on all sides, and struggled to escape. Meanwhile, strong arms were holding it down until the signal was given, when it loosened itself, and with a rush rose to the height of one thousand fathoms in less than ten minutes. It then described a horizontal line, and as it had lost a considerable amount of gas, it began to descend quietly. It reached the ground in safety; and this first attempt, crowned with such decisive success, secured for ever to the brothers Montgolfier the glory of one of the most astonishing discoveries. Their rude apparatus has since been greatly improved.

A young man well versed in physics, Professor Charles, assisted by two practical men, the brothers Robert, threw himself ardently into the investigation of the modes of inflating balloons with hydrogen gas, which was then called inflammable air. Guessing that it was much lighter than that which Montgolfier had been obliged to make use of, Charles leagued himself with his two assistants to construct a balloon of taffeta, twelve feet in diameter, covered with india-rubber, and to inflate it with hydrogen.

The inflation with hydrogen was effected in a very curious manner. As much as eleven hundred and twenty-five pounds of iron and five hundred and sixty pounds of sulphuric acid were found necessary to inflate a baloon which had scarcely a lifting power of twenty-two pounds, and the process of filling took no less than four hours. At length, however, at the end of the fourth hour, the balloon, composed of strips of silk, coated with varnish, floated.

The conveyance of the balloon to the Champ de Mars was a most singular spectacle. A vanguard, with lighted torches, preceded it; it was surrounded by special attendants, and was followed by detachments



A WONDERFUL ASCENSION OF SEVEN MILES FROM THE EARTH.

of night-patrols on foot and mounted. The size and shape of this structure, which was escorted with such pomp and precaution—the silence that prevailed—the unearthly hour, all helped to give an air of mystery to the proceedings. At last, having passed through the principal thoroughfares, it arrived at the Champ de Mars, where it was placed in an inclosure prepared for its reception. When the dawn came, and the balloon had been fixed in its place by cords, attached around its middle and fixed to iron rings planted in the earth, the final process of inflation began. The Champ de Mars was guarded by troops, and the avenues were also guarded on all sides. As the day wore on an immense crowd covered the open space, and every advantageous spot in the neighborhood was crowded with people. Later, the report of a cannon announced to the multitudes, and to scientific men who were posted on elevations to make observations of the great event, that the grand moment had come. The cords were withdrawn, and, to the vast delight and wonder of the crowd assembled, the balloon shot up with such rapidity that in two minutes it had ascended four hundred and eighty-eight fathoms. At this height it was lost in a cloud for an instant, and, reappearing, rose to a great height, and was again lost in higher clouds. The ascent was a splendid success. The rain that fell dampened neither the balloon nor the ardor of the spectators.

The fall of the balloon was caused by the expansion and consequent explosion of the hydrogen gas. This event took place some distance out in the country, close to a number of peasants, whose terror at the sight and the sound of this strange monster from the skies was beyond description. The people assembled, and two monks having told them that the burst baloon was the hide of a monstrous animal, they immediately began to assail it vigorously with stones, flails, and pitchforks. The curé of the parish was obliged to walk up to the balloon to reassure his terrified flock. They finally attached the burst envelope to a horse's tail, and dragged it far across the fields.

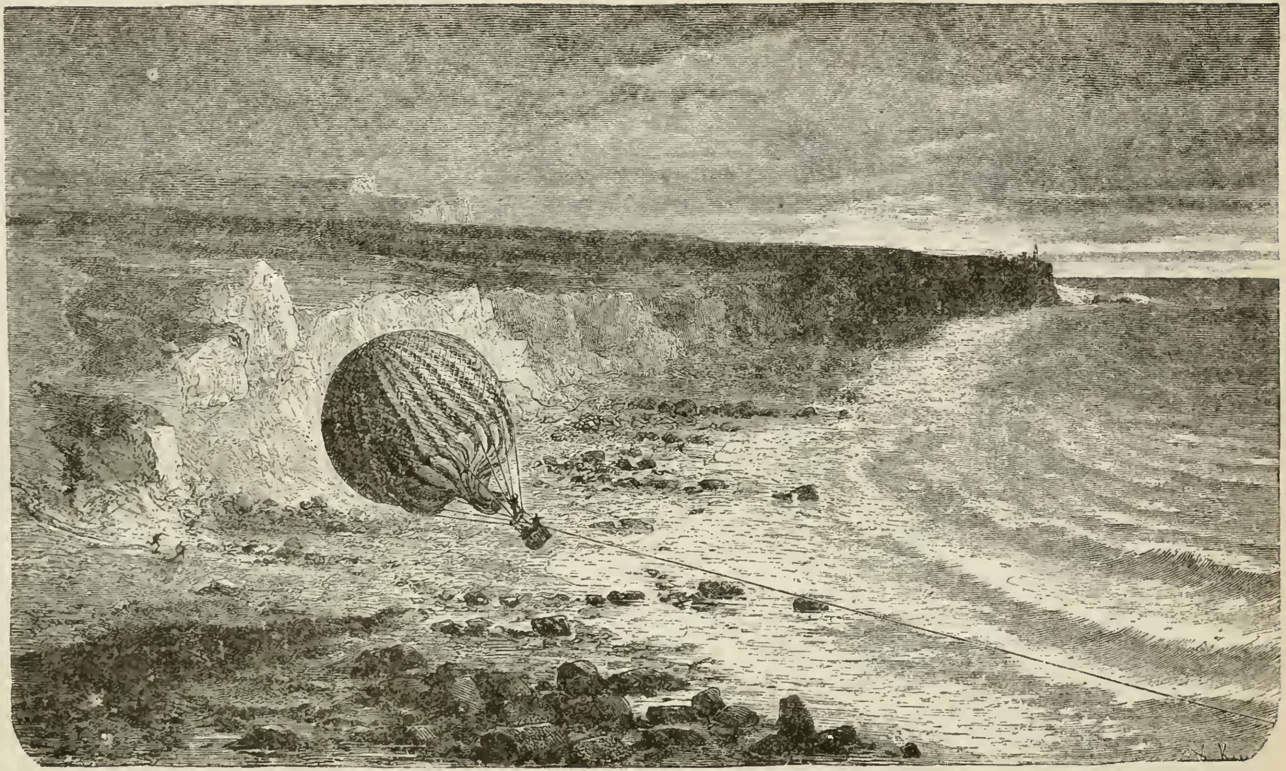
A somewhat humorous result of all this was the issue of a communication from government to the people, entitled, "Warning to the People on Kidnapping Air-balloons." This document, duly signed and approved, describes the ascents at Annonay and at Paris, explains the nature and the causes of the phenomena, and warns the people not to be alarmed when they see something like a "black moon" in the sky, nor to give way to fear, as the seeming monster is nothing more than a bag of silk filled with gas.

The most remarkable excursion ever known was that superintended by Green, from London to Germany. This journey, twelve hundred miles in length, is the longest that has been yet accomplished. Not knowing to what quarter of the globe he might be blown, Green provided himself with passports to all the states of Europe, and with a quantity of provisions sufficient to last him for some time, should he be driven by the wind over the sea. Shortly after mid-day the balloon rose with great grandeur, and, urged by a light breeze, floated to the south-east over the plains of Kent. Later the voyagers sighted the sea.

In an hour the Straits of Dover were cleared, the lights of Calais shone out toward the voyagers, and the sound of the town drums rose up toward them. Darkness was now complete, says the writer, and it was only by the lights, sometimes isolated, sometimes seen in masses, and showing themselves far down on the earth beneath us, that we could form a guess of the countries we traversed, or of the towns and villages which appeared before us every moment. The whole surface of the earth for many leagues round showed nothing but scattered lights, and the face of the earth seemed to rival the vault of heaven with starry fires. Those on the horizon gave us the notion of a distant conflagration. In proportion as we approached them, these masses of lights appeared to increase, and to cover a greater space, until, when right over them, they seemed to divide themselves into different parts, to stretch out in long streets, and to shine in starry quadrangles round the squares, so that we could see the exact plan of each city, given as on a small map. At midnight a black profound abyss surrounded us on all sides, and, as we attempted to penetrate into the mysterious deeps, it was with difficulty we could beat back the idea and the apprehension that we were making a passage through an immense mass of black marble, in which we were inclosed, and which, solid to within a few inches of us, appeared to open up at our approach.

Until three o'clock the voyagers were in this state. The height of the balloon, as calculated by the barometer, was two thousand feet. They had not then anything to fear from a disastrous encounter, when all at once a sudden explosion was heard, the silk of the balloon quivered, the car received a violent shock, and seemed to be shot suddenly into the gloomy abyss. A second explosion and a third succeeded, accompanied each time by this fearful shock to the car. The travelers soon found out that, owing to the great altitude, the gas had expanded, and the rope which surrounded it, saturated with water, and frozen with the intense cold, had yielded to the pressure, in jerks which caused the report and the shock.

At seven in the morning the voyagers made their descent in the Duchy of Nassau. They received a most flattering reception, and, in memory of the event, they placed the flag which they had borne in their car during their adventurous excursion in the ducal palace. Thus



PERILS OF THE DESCENT—THE BALLOON DRIFTING.

terminated an expedition which, whether we regard the extent of the journey, the length of time occupied in it, or the results which were the objects of the experiment, may justly be considered as one of the most interesting and most important ever undertaken After having traversed without hindrance, without either danger or difficulty, so large a portion of the European continent, they arrived at their destination still in possession of as much force as might have carried them round the whole world. This shows that very long voyages may be made.

Repeatedly the balloon has been turned to practical account, and has been made useful in warfare. In the Franco-German war Gambetta ascended from Paris when it was so surrounded by the enemy that there were no other means of escape, and landing outside, attempted to afford relief to the beleaguered city.

During the late Civil War, the part which the balloon played was a more important one. The Government conferred the title of aeronautic engineer upon Mr. Allan, of Rhode Island, who originated the idea of communicating by a telegraphic wire from the balloon to the camp. The first telegraphic message which was transmitted from the aerial regions is that of Professor Love, at Washington, to the President of the United States. The following is this despatch: "Sir.—The point of observation commands an extent of nearly fifty miles in diameter. The city, with its girdle of encampments, presents a superb scene. I have great pleasure in sending you this despatch—the first that has been telegraphed from an aerial station." In the month of September, 1861, one of the most hardy aeronauts furnished important information to General McClellan. The balloon of La Mountain, which arose from the northern camp upon the Potomac, passed above Washington. La Mountain then cut the cord that connected his balloon with the earth, and rising rapidly to the height of a mile and a half, he found himself directly above his enemy's lines. There he was able to observe perfectly their position and their movements. He then threw over ballast, and ascended to the height of three miles. At this height he encountered a current which carried him in the direction of Maryland, where he descended in safety. General McClellan was so much satisfied with the observations taken in the balloon, that, at his request, the order was given to the War Department to construct four new balloons, to be used in conducting military campaigns.

THE TERRIBLE CYCLONE.

Cyclone is the name given to a revolving storm of wind. A revolving storm is simply this:—A stratum of hot air, made hot by contact with the hot earth, and by the power of the sun, is overlaid by a stratum of cold air. From the greater weight of the cold air the natural tendency of the hot air to rise is restrained; some cause, local or general, forces an intermixture of the two strata at a particular point, and establishes the nucleus of the storm. The intermingling of the unwilling elements gives rise to considerable atmospheric disturbance, and the particles of air rubbing against one another get whirled round in a direction suggested by the motion of the earth at the place of disturbance; the example set is followed by adjacent blocks of air; and great bodies of wind, co-extensive with the masses of hot and cold air, are set in motion, taking their revolving rate and direction from the heat or nucleus of the storm. The storm acquires strength in rolling, until the whole attains a circular velocity in severe hurricanes of one hundred miles an hour. But the storm travels, that is to say it has two motions, its own circular motion at the rate just mentioned, and also the direct motion of the wind prevailing outside its circumference at the time. The whole body of the storm is moved along, still gyrating, at the rate of the general wind, and is borne onward always in its direction.

TREMENDOUS POWER OF THE WIND.

Cyclones last only from fifty to sixty or seventy seconds, their breadth varies from a few rods to several hundred yards, and it is probable that the length of their track rarely exceeds twenty-five miles. This phenomenon is usually preceded by a calm and sultry state of the atmosphere, when suddenly the cyclone appears, traversing the earth with great velocity, and sweeping down by its tremendous power the mightiest products of nature, and the strongest works of man. Ponderous bodies are whirled aloft into the air; trees of large dimensions twisted off or torn up by the roots; buildings of the firmest construction prostrated, and streams whirled from their beds and their channels laid bare. A cyclone that occurred in Silesia, carried a mass weighing more than six hundred and fifty pounds fifty feet above the top of a house, and deposited it on the other side in a ditch, one hundred and fifty paces distant.

In one which happened at Maysville, Ohio, a barn containing three tons of hay and four horses, was lifted entirely from its foundations. And such was the force of the wind during a tornado which occurred at Calcutta that a bamboo was driven quite through a wall five feet thick, covered with masonry on both sides; an effect which was estimated, by a person on the spot, to be equal to that produced by a cannon carrying a six-pound ball. By the action of a tornado, fowls are often entirely stripped of their feathers, and light substances carried to a distance varying from two to twenty miles. In the West Indies hurricanes almost always begin from some point eastward of Barbadoes, whence they proceed in a north-westerly course till the resistance of the land and their own exhaustion cause them to flag. Their track is marked by ravages the most terrible and desolating it is possible to imagine. The great hurricane which swept the West Indies in August, 1831, destroyed, in the space of seven hours, in Barbadoes alone, no less than one thousand four hundred and seventy-seven lives and many thousand of dollars worth of property; it carried destruction the most complete along a course extending many hundreds of miles, and was not checked till it had made its way some distance inland on the continent of this country. Trees of seventy feet in height were uprooted, houses were blown down as if made of cardboard, men were blown through the air to some distance, and guns in the fort were dismounted and flung down many yards away from where their carriages stood. The tremendous force of the wind piled up the waters so that they stood in a heap in Carlisle Bay, and ships that had been anchored half a mile from the landing-place were floated and driven half a mile inland and put down in cane-fields, or in what had been cocoa-nut groves. Storms of some violence are not unfrequent in the West Indies, but hurricanes of great fury are specially remembered, and people take them for chronological guides, speaking of what happened in such a year after the "wind."

One remarkable fact in connection with these circle-going storms is the shifts of wind which occur at the places over which they pass. The wind that has been blowing furiously from south-west suddenly drops, there is a treacherous lull for a few minutes, and then, just as the inexperienced in such things fancy that the tyranny is overpast there comes a dreadful blast from the north-east, with power equal to that which so lately made signs of giving up its wild sport. A cross sea is set up, in which it is scarcely possible for a ship to live, and in the trough of which, if she be allowed to fall into it, she must inevitably be drowned.

THE REMARKABLE TRADE WINDS.

That there should be a wind ever constant from the same quarter all the year round, is, apart from the causes of it, a wonderful fact. Columbus first discovered the full extent of the trade winds, when he made his first voyage to this country. Previously he had observed in the neighborhood of the Canaries the frequency of the winds from the same quarter, but it was not till he set out on his first American voyage that he ascertained the extent over which they regularly prevail. The story is well known about the anxiety of Columbus's crew, how they noticed, when well to the westward of Grand Canary, the perpetual breeze from north-east; how they expressed their fears about getting back to Europe, declaring that God was angry with them for presuming to pry into His secrets in the west, and had given them over to the power of the devil, who caused a wind to blow which should ever prevent their return to Spain. Columbus, while he succeeded in overcoming the fears of his sailors, and taught his successors how to sail round the wind which he could not sail against, never seems to have understood the cause of the phenomenon, which, since his time, has been fully discovered.

So far as the name is concerned, it may be pretty safely concluded that it was given because the wind was the sure promoter of commerce, a wind upon which the merchant might certainly count to carry his ships over a known distance of the voyage. As regards the direction from which it blows, when the sun is south of the equator the wind has a little more north in it, and is variable between N. E. and N. N. E. When the sun is north of the line the wind is more easterly.

EXPLANATION OF THE WONDERFUL TRADE WINDS.

The extent of the trade wind region depends entirely upon the sun. When the sun has a southern declination, the trade wind is often not found till the twenty-seventh degree of north latitude; but with a northern declination of the sun the wind gets as far north as thirty-two degrees. Its influence is perceived at from two to seven degrees north of the equator, so that the district over which the wind blows may be estimated at about twenty-two degrees of latitude. The force of the wind is sufficient to propel a ship regularly at the rate of seven to eight miles an hour. It is the capital of commerce, and never fails.

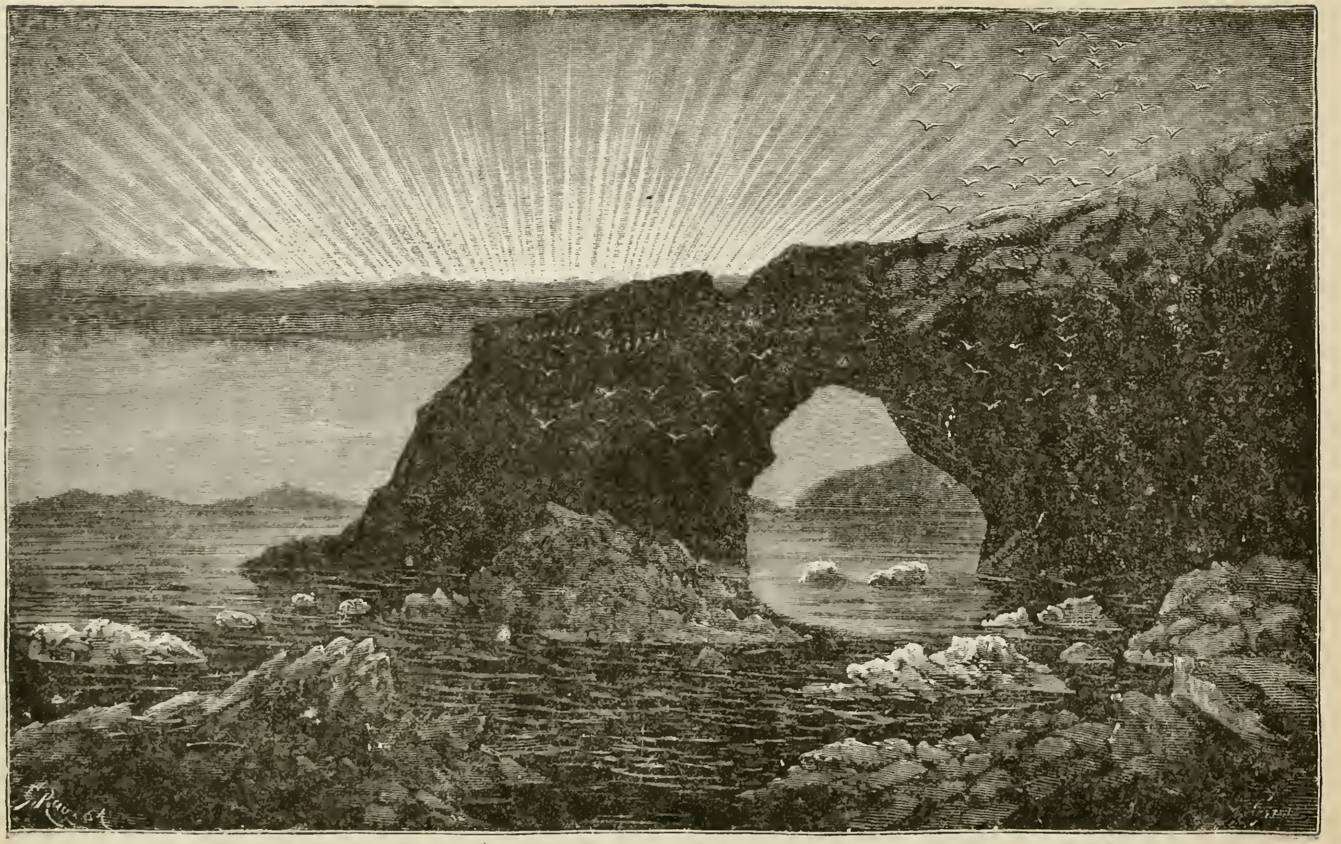
The trade wind theory now accepted may be thus explained:—At either pole is a region of calms, estimated at from one to one and a half degrees in extent. Outside this is a district extending for many degrees over which prevail winds running from all directions towards the pole. Beyond this are the calms of Cancer and Capricorn, in the northern and southern hemispheres respectively; then the north-east and south-east trade winds, and between them the belt of equatorial calms and rains. Such are the facts. Now the rotary motion of the earth from west to east being kept in mind, it will be readily understood that a current of air coming from the north pole, where the earth's motion is scarcely felt, towards the equator, would, the further it traveled south, find itself more and more affected by the rotatory motion. The earth would be, as it were, slipping from under it, going from west to east, so that the current which was flying south would find that it did not go in a straight line, but would get sent away westward, and would blow, therefore, from the north-east; in the same way, the south wind coming north would be converted into a south-east wind.

Now the prevailing winds between the Polar calms and the calms of Cancer are winds which blow towards the pole, so that the current of air which blows towards the equator must overrun them—as, in fact, it does till it reaches the thirtieth parallel of north latitude. There it meets with a counter-current of equal strength, and the two irresistible bodies meeting, cause a pressure or stagnation in the air at the point of contact, the stagnation produced being the calms of Cancer, which stretch over five or six degrees of latitude. Either opponent being unable to conquer, both descend—the north wind to pursue its southerly course to the equator, the south wind to fly onwards to the north pole. The wind which the northern giant met at parallel thirty was a south-west wind, which had blown above and across the extent traversed by the north-east trade. Its history does not differ materially from that of its rival, except that at parallel thirty it has nearly done its travels, whereas the north wind is only just beginning. One wind has made the circuit of the globe, as the wind it meets will have to make the circuit. It has started from the south pole along the upper road (the phenomena of the southern hemisphere are like those of the northern), has encountered the strong north-east wind which overlies and overblows the south-east trades, has pushed against it so hard as to repeat at Capricorn what was done at Cancer, and has swept resistlessly over thirty degrees of latitude as the south-east trade wind. At so near the equator it has been met by the north-east trade wind. The two winds have been hurled at one another with a momentum acquired in a run over thirty degrees of latitude apiece, and have been forced to scale the heavens in order to avoid each other. Away they rush northward and southward respectively.

The conflict which takes place between the winds at the equator, if not more fierce than that which occurs at Cancer and Capricorn, has more visible effects. To it must be attributed those strange convulsions which often make the equatorial region anything but a calm one; those fierce deluges of rain which sweep down from the clouds in sheets, that lightning and that thunder, which are the concomitants of the mighty battle that is being perpetually fought for the supremacy of north and south. The wind goeth towards the south and turneth about unto the north; it whirleth about continually, and the wind returneth again according to his circuits. It is the great purifier of the earth. It is the foe of pestilence and all forms of disease, the source of life and health.

COLORED SNOW AND RAIN.

Red snow is a phenomenon which is frequently observed in the Polar regions, and has occasionally been met in the Alps and in Scotland. Captain Ross discovered, on the shore of Baffin's Bay, a range of cliffs extending for eight miles, which were covered with a red snow of a brilliant hue, and sometimes as much as twelve feet in depth. The cause of the appearance was a puzzle to men of science as well as to



ATMOSPHERIC SPLENDORS—THE AURORA BOREALIS, the observers, until careful examination with the microscope revealed that it was due to the presence among the snow of a very minute plant, whose cells were filled with animalcules.

There are on record several incontestable instances of black rain having fallen, among which the following may be mentioned: Professor Barker laid before the Royal Dublin Society some observations on a shower of black rain which had fallen around Carlow and Kilkenny, and extended over an area of more than four hundred square miles. He presented to the society a specimen which had been forwarded to him, the person who had collected it mentioning that at the time that it fell it was uniformly black, and resembling ordinary writing ink. Barker found, however, that after allowing it to stand for a short period, the black coloring matter separated from the water with which it had been mixed, rendering the color of the rain much lighter than at first. This shower was preceded by such darkness that it was impossible to read except by candle-light. After this darkness had continued for some time, a hail-storm occurred, attended with vivid lightning, but without thunder, and when this subsided the black rain fell. On examination of the rain just after it had fallen, it was found to have an extremely fœtid smell, and a very disagreeable taste; it left a stain upon some clothes on which it had fallen, and cattle refused to drink it. It fell in the afternoon, rendering quite black the people's clothes on the hedges, and those spread on the grass to dry; also giving to the water caught in tubs and vessels from slated and tiled houses, almost the color of ink. Some rain which had fallen in the morning had been perfectly clear, and the black rain appeared to fall from one particular cloud.

The material that mingles with these extraordinary rains is of a dark color, and imparts an inky blackness to the shower. A rain of this kind occurred at Montreal, in Lower Canada, on two several days. A dense gloom enveloped the city, while the whole atmosphere was obscured by a thick haze, of a dusky orange color, and at this time rain descended of a dark inky hue. The weather soon after became pleasant, and continued so until the following day, when at noon the whole city was again shrouded in a heavy, damp vapor, so dense that it became necessary to light candles in all the houses. Soon after, when the darkness was the deepest, the gloom was dispelled by a vivid flash of lightning, which was followed at once by a crashing peal of thunder; and this was succeeded by a heavy shower of thick, black, rain.

A storm of red hail is stated by Baron Humboldt to have once occurred at Paramo, in South America, between Bogota and Popayan. There likewise fell over all Tuscany in 1813, a shower of hail of an orange hue. A hail-storm happened in Ireland in 1849, which deposited upon the ground a black, inky substance. Some of this dark matter was collected and examined, and found to be of the same nature as the coloring material of red rains. The air around us has its mysteries.

EXTRAORDINARY SHOWERS.

From time to time, and in regions of the globe widely separated from each other, dust in large quantities has descended from the heights of the atmosphere, not only upon the land, but also far out on the ocean, hundreds of miles from the shore. It is entirely distinct from that which is disseminated through the air by the winds, during the eruption of volcanoes, and for many years has been described, by observers and writers, under the various names of dust-storms, dust-rain, red fogs, Sirocco dust, African dust, sea-dust, Atlantic dust, and trade wind-dust. This dust not only falls dry, in the form of a fine, impalpable powder, but is occasionally mingled with rain, hail and snow, which it dyes with its own hue. As it is usually of a reddish color, these showers of rain and storms of hail and snow have received the appellation of blood-rains.

A shower of dust fell at Malta in 1830, and at the same time a similar fall occurred in the bay of Palmas, in Sardinia, while a Sirocco wind was blowing from a south-easterly quarter. The Maltese dust was of a brownish-red hue. Some of it was collected and forwarded to Mr. Charles Darwin, the eminent naturalist, for examination. In the year 1831, the ship "Beagle" was despatched by the British government on a voyage of scientific discovery around the world. Mr. Darwin accompanied the expedition, and during the voyage observed a dust-shower, near St. Jago, the chief of the Cape de Verd Isles. He collected a little package of impalpable brown-colored dust, which appeared to have been filtered from the wind by the gauze of the vane at the mast-head. In speaking of this phenomenon, he remarks, that the atmosphere in this region is usually filled with a haze, caused by the falling of this fine, brown-colored dust. By the kindness of a friend, Mr. Darwin received four parcels of dust which fell upon the deck of a vessel, a few hundred miles north of the Cape de Verd Isles.

Much valuable information respecting dust-showers on the ocean has been gathered by this gentleman, who has found fifteen different accounts of the descent of dust upon ships when far out on the Atlantic. It has often fallen upon them when they were several hundred, and even a thousand miles from the coast of Africa, and at points sixteen hundred miles distant in a north and south direction. In some of the dust collected upon a vessel three hundred miles from land, particles of stone were discovered, more than the thousandth of an inch square, mixed with finer matter. It falls in such quantities as to soil every thing upon which it descends, and to irritate the eyes of persons exposed to it. Ships have even been known to run ashore, owing to the obscurity of the atmosphere resulting from the presence of this dust, widely diffused through the surrounding atmosphere.

During a voyage from Richmond, Virginia, to Rio Janeiro, in the winter of 1845-6, Mr. Thomas Ewbank, of the United States Patent Office, met with many instances of the falling of sea-dust, and traced the rich and peculiar hues, that at times adorned the clouds and sky, to the diffusion of this fine powder throughout the intermediate atmosphere. Once he observed a narrow belt of slate-colored sky skirting the horizon, while upon this rested a broad band of vermilion, interspersed with soft dashes of India ink, shaded with umber. These hues changed, by insensible degrees, into a bright, cream-color, and this again into a pale, delicate green, which deepened in tint as it approached the zenith, while over all floated amber-colored clouds, growing richer in hue and smaller in size as they sunk towards the horizon, painting the sky with the most delicate tints.

During the two following days the heavens presented scenes of gorgeous and surpassing beauty, the colors of the sky and clouds ranging through emerald green, pink, purple, crimson, yellow, chocolate, umber, and slate; while beneath this rich and varied combination a groundwork of the purest cream-color extended, giving tone to the whole, and changing in tint from a fawn-color to a pale white.

BRILLIANT PHENOMENA IN THE SKY.

The wonderful sunsets noticed within the last few years have been attributed to causes similar to those just mentioned. Tremendous volcanic action, especially in the island of Java, whereby immense quantities of dust have been thrown up, has been thought to account for the vivid colors of the heavens, the diffused substance acting as a reflector for the light.

Not merely have showers of dust and inorganic matter excited the wonder of men of science, but there have been showers of living organisms. In 1833, at Lake Gwynant, in the county of Caernarvon, a woman was engaged washing a pail at the edge of the lake, and a number of children were with her. While she was thus employed, a shower of small fishes fell partly into the lake, partly upon the land, close to where the woman was. The fish resembled herrings, but were much smaller. A heavy shower of rain had preceded the descent of these fishes, and the day following there was much rain and thunder. Soon after a most violent storm of rain and wind, three small crabs were found in the area of the workhouse at Reigate; and a fourth was afterwards found at a little distance the following morning. One of them appeared to be still living. In the morning of the day previous to the storm the area of the workhouse had been thoroughly swept and cleaned; consequently they must have been seen had they been there then. They were found by a boy, who told the governor that he had found a comical sort of a frog. The inhabitants of the island of Isla, Argyleshire, after a day of heavy rain, were surprised to find numbers of small herrings strewed over their fields, perfectly fresh, and some of them exhibiting signs of life. Similar instances of showers of small fish are well authenticated. In a pasture-field in the parish of Stansted, which is a considerable distance from the sea or any branch of it, and a place where there are no fish-ponds, there were found fish in quantity about a bushel, supposed to have been rained down from a cloud, there having been at that time a great tempest of thunder, hail and wind. These fish were about the size of a man's little finger; some were small whitings, others like sprats, and some rather like smelts. Several of these fish were shown publicly at Maidstone and Dartford, Kent.

WONDERFUL METEOROLOGICAL INSTRUMENTS.

The pressure of the atmosphere is ascertained by the barometer. This instrument is of the highest importance in meteorology. Into a glass tube, about three feet in length, open at one end and closed at the other, mercury is poured until it is full; the open end being now closed by the finger, or any other means, the tube is inverted, and the lower end immersed in a vessel of mercury. When beneath the surface of the fluid the end is unstopped, and the column of mercury within the tube then settles down, until its summit is about thirty inches above the level of that within the vessel. The space above the column in the tube is a void, and is called the Torricellian vacuum, from Torricelli, the name of the Italian philosopher, who first constructed this instrument. The column of mercury within the tube is supported above the level of that in the vessel, by the upward pressure of a column of the atmosphere, having the same base as itself. Any increase in the density of the atmosphere will be denoted by an elevation of the mercury, and a decrease by its depression.

As the approach or departure of storms is always indicated by changes in the density of the atmosphere, the barometer becomes a sure indicator of the weather, the mercury rising or falling according to the atmospheric pressure. Density indicates humidity, and hence rain and storm; rarity, the opposite.

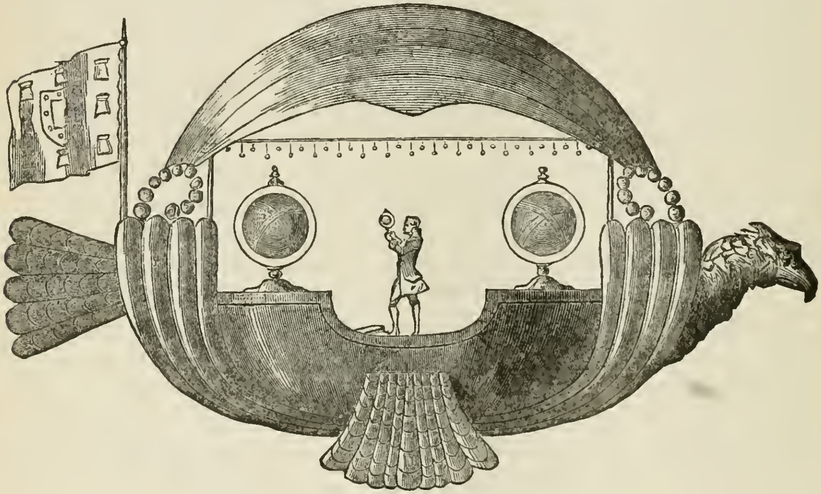
Since the constant changes in the weight of the atmosphere produce corresponding fluctuations in the height of the barometer, a scale is placed near the top of the tube, extending from twenty-seven to thirty-one inches, a space which includes at the surface of the earth, all the fluctuations of the column. This scale is divided into tenths of an inch; but, as the variations of the barometer are exceedingly minute, a contrivance called a vernier is annexed, by which a change, to the extent of one-five hundredth of an inch, can be easily measured.

The temperature of the atmosphere is indicated by the thermometer. It consists of a small glass tube, terminated by a bulb, and is partially filled with mercury. This fluid is usually preferred for several reasons, the most important of which are, its uniform dilation, its quick susceptibility to any change in temperature, and the great range of its expansion in the fluid state. If the instrument is to be exposed to extreme cold, alcohol must be used. As mercury, like other fluids, expands by heat, and contracts by cold, its alternate elevations and depressions within the tube can be made to indicate the corresponding changes in the state of the air, if two fixed temperatures can be found, whence to reckon the changes. These have been discovered. If a thermometer is immersed at different times in melting snow, the column of mercury invariably sinks to the same place in the tube, though many months may have elapsed between the experiments; and, when exposed to the steam of boiling water, the mercury always ascends to the same height under the same atmospheric pressure, vibrating with remarkable uniformity.

FLYING MACHINES—ATTEMPTS TO TRAVEL WITH WINGS.

The first attempt at flying occurred early in the sixteenth century, when an Italian adventurer visited England. He was very favorably received by James IV. of Scotland, and having promised to gratify the Court with the exhibition of a plan which would enable any person to visit the most distant regions in a few hours, he had an apparatus made consisting of huge wings, to be propelled by cords. Thus equipped, the adventurer leaped from the wall of Stirling Castle, and, as might have been expected, speedily reached the ground. His reasoning on this unlucky result is worthy of being preserved: My wings, said he, were composed of various feathers; among them were the feathers of a dunghill fowl, and they, by a certain sympathy, were attracted to the dunghill on which I fell; whereas, had my wings been composed of the feathers of eagles alone, as I proposed, the same sympathy would have attracted my machine to the higher regions of the air. This sophistry is at least ingenious.

A newspaper in 1709 contains a curious description of a Flying Ship, stated to have been invented by a Brazilian priest, of which we give an illustration, copied from an old cut. The ship, which at both ends was scallop-wise, had sails which turned as they were directed; there were two wings to keep the ship upright, and a stern to govern it. In the body, at each end, was a pair of bellows, to be blown when there was no wind; two globes of metal, to cover two loadstones to draw the ship after them; the body was of thin iron plates covered with straw mats for ten or twelve men besides the constructor. Above the body was a network of iron wire, on which were fastened large amber beads, which, by a secret operation, would help to keep the ship aloft; also by the sun's heat the mats that lined the ship would be drawn towards the amber beads. The artist, by the help of the celestial globe, a sea-map and compass, was to take the height of the sun, thereby to find out the spot of land over which they were on the globe of the earth. There were pulleys and ropes to hoist or furl the sails; but we do not find that the design was at all practicable. The inventor was a visionary.

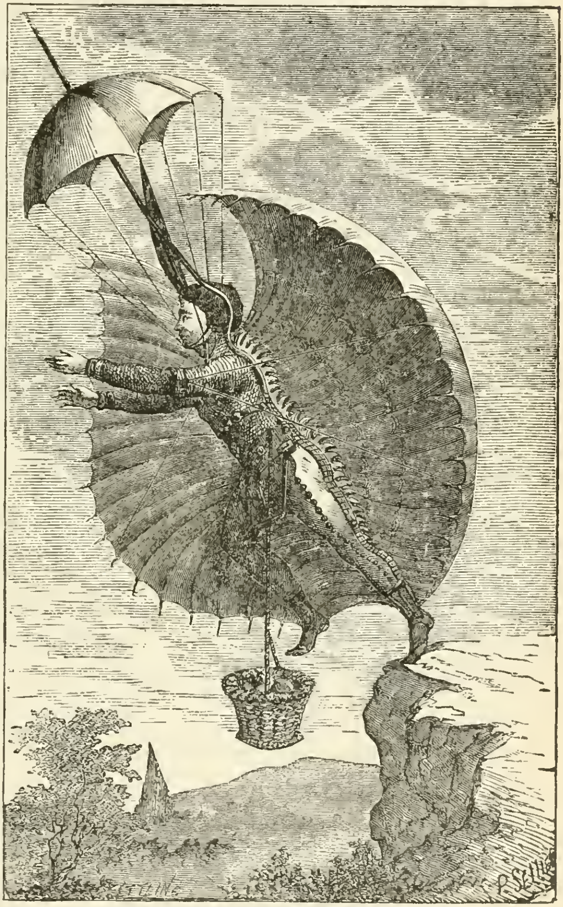


THE FAMOUS FLYING SHIP.

Doctor Darwin proposed to use wings similar to those of a bird, and to these motion was to be given by a gigantic power worked by high-pressure steam. The details of his plan were not fully drawn out; but a few years afterwards Sir George Cayley attempted to show, by reference to mathematical data, that a flying chariot might readily be constructed so as to rise in the air. We believe this ingenious inventor expended a large sum of money in endeavoring to mature his plans, but they ended in failure.

The Abbé Deforges, of Etampes, announced in the journals in 1772 that he would perform the great feat. On the appointed day multitudes of the curious flocked to Etampes. The abbé's machine was a sort of gondola, seven feet long and about two feet deep. Gondola, conductor, and baggage weighed in all two hundred and thirteen pounds. The pious man believed that he had provided against everything. Neither tempest nor rain should mar his flight, and there was no chance of his being upset; whilst the machine, he had decided, was to go at the rate of thirty leagues an hour. All his calculations were fully made.

The great day came, and the abbé, entering his air-boat amidst the applause of the spectators, began to work the wings with which it was provided with great rapidity. But, says one who witnessed the feat, the more he worked, the more his machine cleaved to the earth, as if it were part and parcel of it.



THE WONDERFUL FLYING MAN.

Retif de la Brétonne, in his work upon this subject, gives the picture of a flying man, furnished with very artistically designed wings, fitting exactly to the shoulders, and carrying a basket of provisions suspended from his waist. To wings aerial adventurers mostly adhered. The Marquis de Racqueville flew from a window of his hotel, on the banks of the Seine, and fell into a boat full of washerwomen on the river. All these unfortunate attempts were lampooned, burlesqued on the stage, and pursued with the mockery of the public. Up to this time the efforts of man to conquer the air had miscarried. They were conducted on a wrong principle, the machinery employed being heavier than the air itself. But, even before the time of Montgolfier, the principles of aerostation began to be recognized, though nothing was actually done in the way of acting upon them. Thus, in 1767, Professor Black, of Edinburgh, announced in his class that a vessel, filled with hydrogen, would rise naturally in the air; but he never made the experiment, regarding the fact as capable of being employed only for amusement. Finally, Cavallo, in 1782, communicated to the Royal Society of London the experiments he had made, and which consisted in filling soap-bubbles with hydrogen. The bubbles rose in the atmosphere, the gas which filled them being lighter than air.

In the higher regions of the atmosphere, the union of warm and cold air, when the combining volumes are over saturated, will appear in the form of clouds. During the daily process of evaporation, warm, humid currents of air are continually ascending from the earth; the higher they ascend, the colder is the atmosphere into which they enter; and, as they continue to rise, a point at length will be attained, where, in union with the colder air, their original humidity can no longer be retained; a cloud will then appear, which increases in bulk with the upward progress of the current into colder regions. If the cloud, however, in its ascent, either meets with a warmer stratum of air, or descends towards the earth into a region of a higher temperature, a portion of the minute globules of water which compose it, perhaps all, will be re-dissolved, and the cloud will either contract in size, or completely vanish, according to the increase of heat to which it is subjected.

The effect of a screen in checking radiation, and thus preventing frost, has been finely illustrated by experiments in India. Throughout the whole region of Upper India, ice is artificially procured by placing upon a layer of dry straw, in the bottom of small pits, and fully exposed to the clear sky, broad, shallow earthen pans, filled with water. Such is the radiation during the night, that a thin crust of ice will sometimes form upon the water, when the temperature of the air on a level with the pits is ten degrees above the freezing point.

CHAPTER XV.

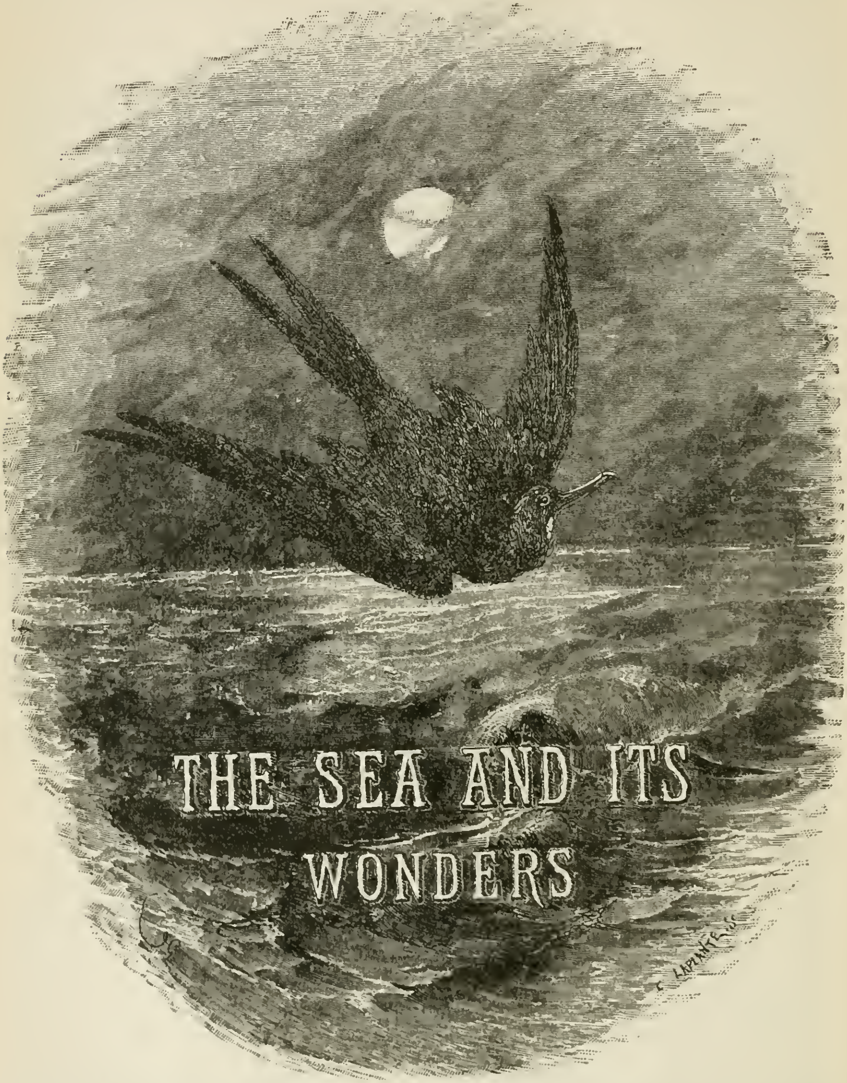
WONDERS OF THE OCEAN.

The Ocean a World in Itself—Wonderful Sea-Plants—Mermen and Maids—The Famous Nautilus—The Devil Fish—Immense Poulpe—Crabs that Seem to Reason—Nest-Building Fishes—Curious Barnacles—Sponges—The Saw-Fish—The Torpedo—Rainbow Beauty of the Sea—Colored Waters—The Flying-Fish—Dolphins—The Sea-Serpent—Ocean Flowers—Sea Anemones—A Crab with a Pack on his Back—The Wonderful Star-Fish—The Medusæ—The Coffre-Fish—Creatures in Armor—A Thieving Crab—Marvelous Corals—A Strange Fan—The Brain Stone—Singular Fishes—The Sea-Porcupine—A Fish that Travels on Land—Gems of the Ocean—The Gulf Stream—Bay of Naples and Vesuvius—Wonderful Depth—Sea-Cucumber—Female Pirates—Strange Tales of the Ocean.

WONDERS abound in the ocean. It is a world in itself, and is subject to its own laws. "In this great and wide sea are creeping things innumerable, both small and great." Animals, plants and insects have a home within its waters, far beyond the domain or even the reach of man. The fantastic forms and shining creatures that people the recesses of the deep are here placed before the reader, and the sea is made to give up its marvelous creations.

The sea is full of plants that float about in the water, or else are attached to some rock at the bottom of the ocean. For a long time nobody cared about sea-weeds, or took the trouble to examine them, but now they are as carefully studied as the plants that grow on the land. Many of them are of delicate formation, and very beautiful. They make gardens at the bottom of the ocean. Their colors are red, and green, and yellow, and purple. All manner of living creatures dart about among them. The scene is as varied and as gay as if it were on land. Indeed, it is almost like fairy-land. When night comes, millions of tiny creatures shine and sparkle like the glow-worm or the fire-fly. The depth of the ocean is full of beauty by night and by day. Sea-weeds are quite different from land plants, though they have leaves and a root. The root holds the sea-weed to its place on the rock. But it does not suck up the moisture as the root of the land plant does. There are no little cells in the leaf of the sea-weed to carry the moisture all over it. It must be plunged entirely in water, if it is wanted to live, but it will retain its color when taken from its briny home, and preserve its beauty a long time.

Mermaidens and mermen have from early ages been reckoned among the wonders of the sea. Poets have sung of their wondrous beauty and power, historians of the most irreproachable veracity have chronicled their appearance; writers of natural history have asserted most decidedly a belief in their existence, and even in the present day there are men of education and science who believe that if Nature has not produced a mermaid, she has been wanting in her duty, as not


THE SEA AND ITS WONDERS
C. LAPLANTE. SC.

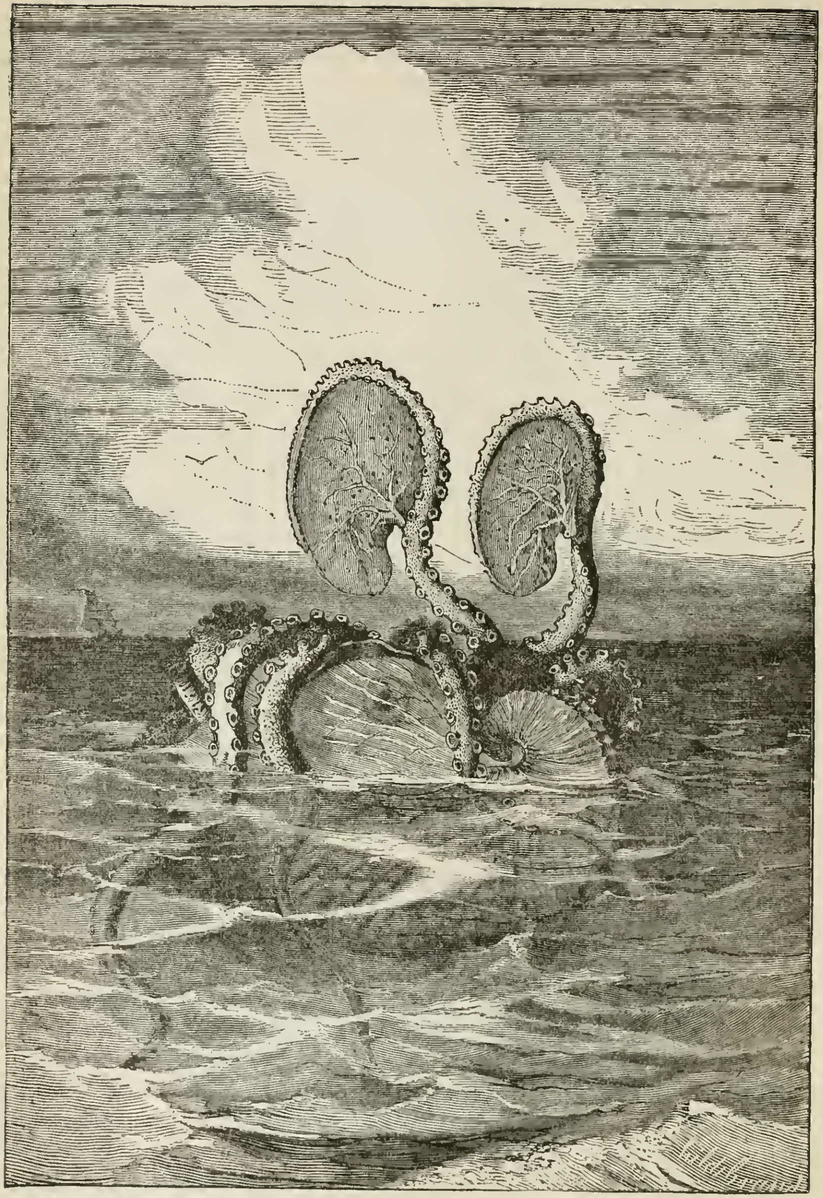
having completed the chain of vertebrate animals. It will not be thought surprising that the idea of the poet differed considerably from that of the man of science. There is an old story extant of the fishing-up of a merman on the Sussex coast in 1187. This creature, who acted like a man in every respect but that of speech, was kept by the governor for six months, when we are left to infer that it died, but the chronicle sayeth not.

A singular story is told by Captain Richard Whitbourne, of Exmouth, in Devonshire, of the appearance of a mermaid in the harbor of St. John's, in the year 1610. From the description he gives of it, he must have been favored with a sight of a very near approach to the poet's ideal; around the head he thought he saw many blue streaks resembling hair; fear, however, prevented his examining it more minutely, for on seeing it approach him swiftly, he fled with precipitation. Subsequently, it went to a boat wherein the captain's servant was with several others, put its hands upon the side of the boat, much to the terror of the men, one of whom struck it a blow on the head, which caused it to loose its hold; it afterwards swam to other boats, the men in which fled ashore and watched it from there. The latest mermaid known was that exhibited by Barnum, a few years ago, and was a singularly ugly object. It proved, on examination, to be an ingenious combination of the head of a monkey with the tail of a fish, and was a transparent humbug.

The sea, however, produces inhabitants sufficiently wonderful without our manufacturing from imagination any such curiosities as mermen and mermaids, which are simply freaks of fancy, and nothing more.

THE WONDERFUL ARGONAUT.

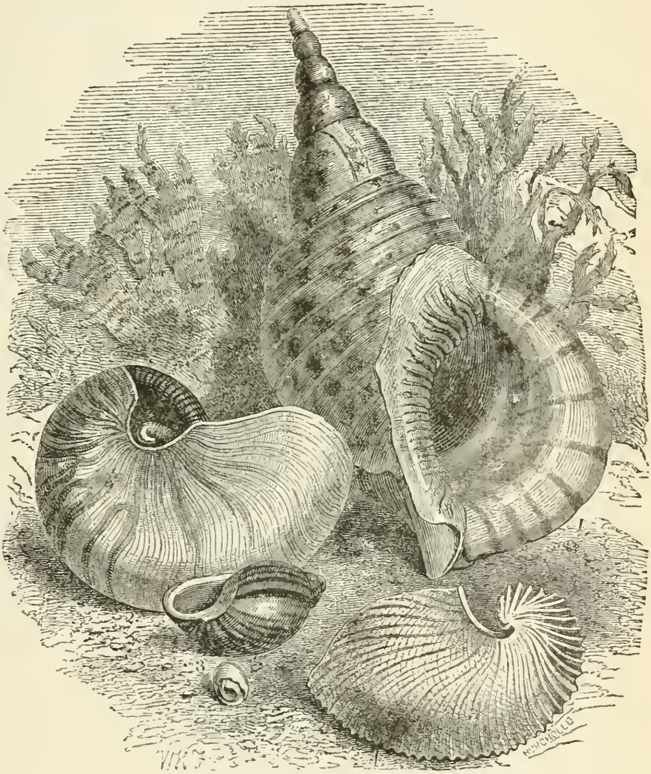
One of the families of cuttle-fish lives in the most beautiful dwelling that was ever formed by the hand of Nature, a dwelling that has been the wonder of mankind in all ages, the shell of the paper nautilus, or argonaut. Only one of this tribe is possessed of an outward shell; and, certainly, it makes up for the ugliness of its race, that is, as far as the shell is concerned. The creature itself is a mere cuttle-fish with long arms. It sits quite loosely in its shell, and is only joined to it by a pair of muscles. It had the name of argonaut given to it, for it was once thought to be a first-rate sailor. The Argonauts were a band of heroes, who went in search of the Golden Fleece. It was even fancied that the first idea of a ship was taken from the shell of the nautilus as it glided over the sea, using its arms for sails. A great deal of poetry, and of prose too, was written on the subject, but it has all turned out to be a mere romance. The argonaut is not often seen to sail. It creeps at the bottom of the sea, using its arms as feet. If it swims, it is by forcing the water through its air-tube, as the cuttle-fish



THE MARVELOUS ARGONAUT IN THE OPEN SEA.

does. It is, now and then, found on the surface of the waves; but the moment it is alarmed, it hides itself in the shell, drawing in the whole of its body. Then the shell loses its balance, turns over, and sinks to the bottom. It is therefore no easy matter to catch sight of the paper nautilus, much more to get possession of it.

The two arms of the creature, which were thought to be used as sails, end each in a broad membrane. The broad membranes do indeed look a little like sails, but they are never used for any such purpose. The creature often keeps them folded over its shell, as if to protect it. Then the shell is quite hidden from sight. But what is the use of these two sail-shaped arms? This has been found out by careful study. They are the organs by which the beautiful shell is made, and by which it is kept in good repair.



SHELLS OF THE WONDERFUL NAUTILUS.

The vela or arms of the argonaut have the faculty of depositing earthy matter wherever it is wanted. This was found out by a lady who devoted herself to the study of the argonaut. She was determined to begin at the beginning, and she reared some little argonauts from the time they came out of the egg. As they grew up, she watched them very narrowly. She saw the process of depositing the shell, and its gradual growth. When the shell was fully formed, she made an experiment. She broke a shell, and then left it, to see what would happen. The next day she went to look. She found a thin cobweb-like substance spread over the edges of the broken pieces and joining them together. The next day she looked again. The substance had thickened, and the edges were much firmer. Day after day the repair went on. The substance grew harder and thicker, until at length the edges were firmly joined and the shell mended. The lady had watched the whole proceeding, and she declared that the argonaut applied its vela to the outside of the shell. And she felt certain that the glutinous substance which mended the shell came from the vela.

There is a relation of the argonaut that makes a shell with chambers in it. This is a shell which no doubt you have seen many times, for it may be met with in every collection of shells. It is called the pearly nautilus. The creature that lives in the shell is so timid and keeps in such deep water, that it is very rarely caught sight of. Only once has the shell been taken with the animal in it.

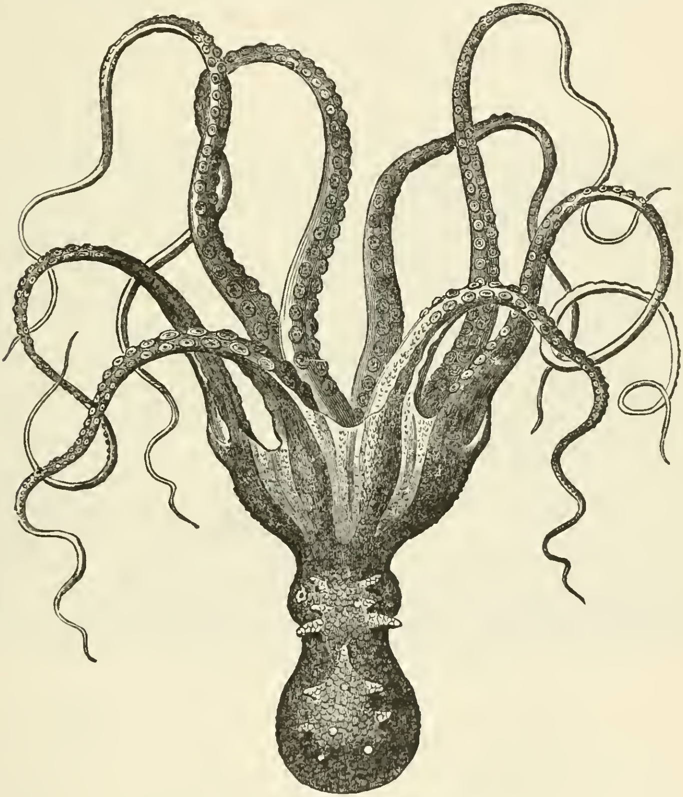
The shell of the pearly nautilus is as curious as it is beautiful. It has a number of chambers in it, one after the other. The last formed is the largest; and here the creature lives, the empty rooms being behind it. At first there was but one room; the creature lived in it. But its wonderful membrane went on secreting shelly matter, until it had formed another. When all the chambers were finished, and as it were shut up, the nautilus had attained to its full size. Then it lived in the last cell of all, having crept to it through the rest. A fleshy tube unites all these chambers together, from one end of the shell to the other. This tube ends in the body of the animal, and increases with its growth. Ages and ages ago, when the lily stars were in their beauty, a kind of nautilus that is now extinct lived in the sea. The remains of the shells are found in a fossil state, and are called ammonites. They show what fine forms of life once existed.

THE CUTTLE-FISH.

The mollusks, or soft-bodied animals, compose a very large class. Creatures of different shapes and sizes belong to it. The fiercest, ugliest, and most dreaded of the whole tribe is the cuttle-fish. The name of the order to which he belongs is called Cephalopoda. The word is taken from two Greek words meaning "head," and "feet." And, as you perceive, his feet grow out of his head. You can call them arms, if you like. He can not only creep on them at the bottom of the sea, but he can seize his prey with them. In some parts of the world, the cuttle-fish grow to a monstrous size, and are frightful objects.

Notice the deadly apparatus in the arms of the cuttle-fish. There are rows of suckers down each arm, as every specimen will show. These do not suck the blood of the victim, as is sometimes stated. They are so many wonderful machines to enable the arms to cling closer to the prey: so close indeed do they cling, that no power can force them away. Each sucker is a kind of cup, composed of a muscular membrane, and with a thick fleshy rim. The creature has the power of exhausting the air within the cup. When the arms have seized upon an object, the rims of all the numerous cups at once adhere or stick to its surface. The cuttle-fish will rather have his arms chopped off than quit his hold, and no object within his grasp can possibly escape.

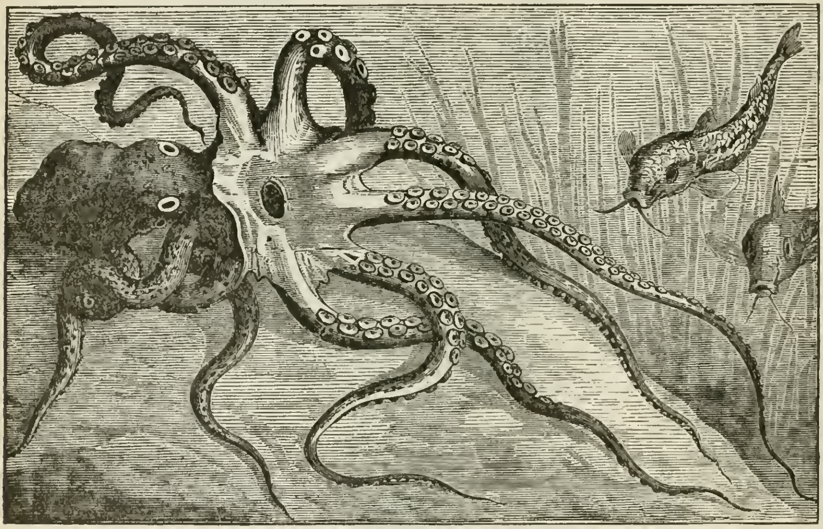
In some kinds of cuttle-fish there are two arms longer than the rest. From the middle of each sucker there is a sharp strong hook, which can be plunged into the slippery surface of the prey and help to secure it. The prey, thus seized, is hurried to the mouth. If it has a shell, the shell is soon crushed by a hard, horny beak, like that of a parrot, and with which it comes in contact. The jaws are literally imbedded in muscle, and open and shut with the utmost force. Thus a victim, once dragged to this terrible mouth, is very soon devoured. A number of sharp horny hooks are placed on one part of the tongue. These



THE SINGULAR CUTTLE-FISH.

hooks bend backwards, and so when the cuttle-fish swallows, they help to drag the pieces of food down its throat. The creature has two eyes, of a remarkably unpleasant expression. In one species the eyes are placed on little stems or stalks made of muscles. They can thus move about, and see all ways at once.

The cuttle-fish cannot be admitted into the rank of the vertebrated animals—that is, animals with a bony skeleton. Like the polyps and the star-fishes, it secretes a hard substance within its body. But these secreted pieces are quite different from the bones of animals. They have no connection with the body, and do not possess, in themselves, the means of growing, as our bones do. They are mere dead shells or pieces of stony substance, formed layer by layer, and laid on from without. The cuttle-fish is formed to live in the sea, and it breathes as the fish does, through gills, or, as they are called, branchiæ. These gills are hidden in a hollow of the body. This hollow or tube expands and contracts, as our lungs do. It is open to the water by two slits; one lets the water in, and the other allows it to flow out. Sometimes the cuttle-fish will suddenly and violently expel the water in its tube. This sudden movement will cause the creature to shoot through the water like an arrow. Sometimes it will even spring up into the air, as the flying-fish does, and reach out its long arms for the prey.



THE IMMENSE POULPE FISH.

The sea is full of cuttle-fishes, as it is of star-fishes. They are found everywhere. There is one hideous creature called the poulpe or polypus. It leads a solitary life on some rocky coast. It lies in a hole or cleft of the rock, its arms stretched out ready to seize a victim. But, as a rule, the cuttle-fish likes society. Except the poulpe, all the other tribes wander in flocks or troops. They are so greedy that they make havoc among the smaller inhabitants of the sea. When they are near the shore they eat up all the fish they can find, so that there are none left for the fishermen to catch. And they are cruel as well as greedy ; like the tiger on land, they will kill for the mere sake of killing.

As the cuttle-fish has so many enemies, Nature has given it a means of defence besides its suckers and long arms. There is a bag in the body full of a black fluid like ink. If the creature is alarmed, it throws out a quantity of this ink, and makes the water so black that no one can see where it is. Under cover of the black cloud it escapes. This ink is called sepia. It is very useful to artists in painting their pictures ; and when dried, it can be kept any length of time without spoiling. The ink-bag taken from a fossil cuttle-fish had ink in it just as good as if it had been fresh. Cuttle-fishes multiply themselves in a wonderful manner, so there is no fear of the race being destroyed. The eggs are in a great bunch, something like grapes, and are fastened to the stem of a sea-weed. But if the cuttle-fish lives a long way from the shore, its bunches of eggs are not fastened to anything. They float on the surface of the sea. The warmth of the sun hatches them. Then out come the little cuttle-fishes, and begin at once to wander about in troops, and to lead a life of plunder, nor do they need much teaching.

WONDERFUL INSTINCT OF THE CRAB.

In the mountains of some of the West India Islands live what are called " violet crabs," which hide themselves for a great part of the year either in holes of the rocks or in the hollows of trees. Scarcely anything is either seen or heard of them. All at once the rainy season sets in with great violence, and then a commotion takes place among the crabs. They are seized with a wish to go to the sea-side. The mother crabs want to lay their eggs on the sea-shore.

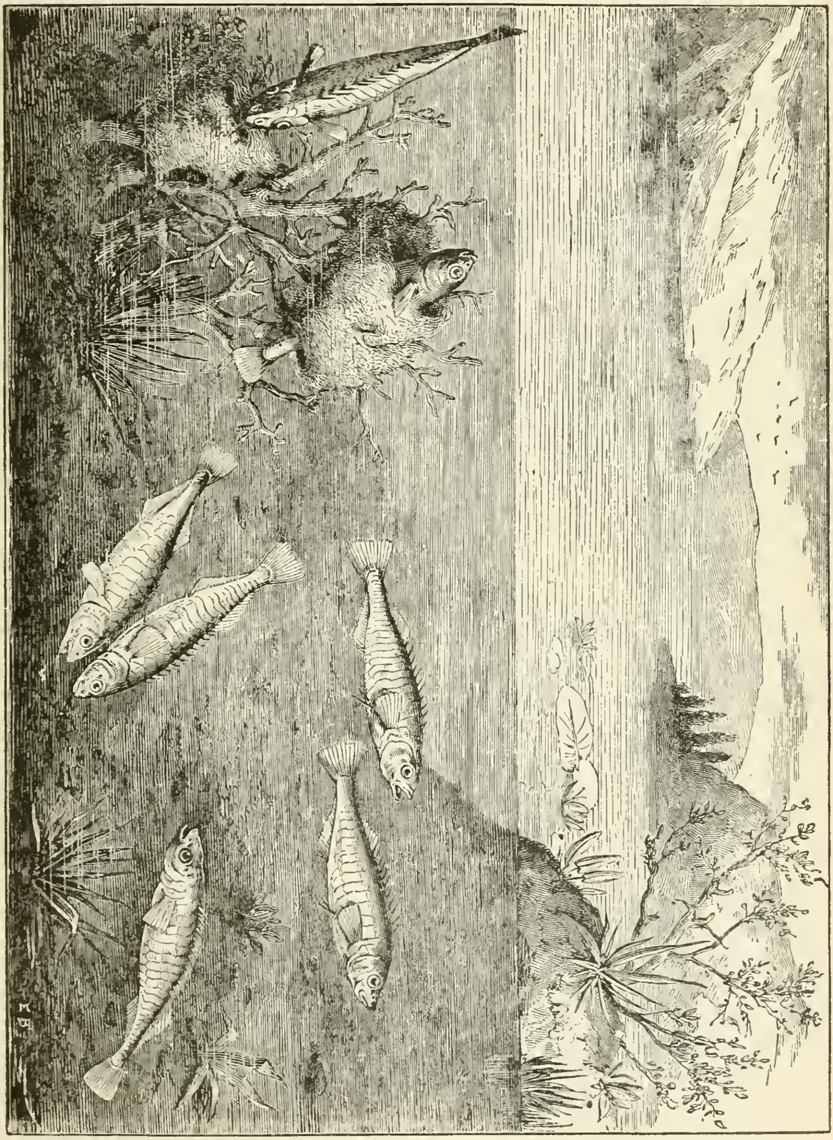
So the vast host of crabs set out on a journey thither, and the compact line sometimes extends for three miles. They literally cover the roads, woods and gardens on the route, and their noise may be heard a long distance. They travel by night, because this is the safest time, and the strongest go first, as it were to clear the way. Then come the mother crabs, and last of all, those that are old and feeble. No obstructions on the road, such as fences or ditches, can stop them, and if any-one meets them they rattle their claws and try to frighten him away with a great noise. If a door of a house be open, they are very likely to march in. Instinct has taught them the nearest way to the sea, and they never turn from it. Should a poor crab get hurt, the others eat him

After the army reaches the sea a great deal of business has to be done. First of all, the crabs take a bath in the waves. Then the mother crabs lay their eggs. When this is over, all the crabs retire into holes and snug corners, to cast off their armor. After the wriggling and struggling has been gone through, the crabs come out weak and faint, and have to wait a little time before they can do anything more. As soon as they have recovered strength enough, and their new armor has begun to appear, they set off home again. But the journey back is not quite so pleasant. The crabs are tired and feeble, and a great many of them are caught and killed by the way. Indeed, but a small remnant of the host gets safe back. After a time the little crabs come out of the shell, but they are not in the least like their parents. The young crab is the most absurd looking creature in the world. Its head is like a helmet with a long spike sticking out of it. Then it has a long beak, and a pair of great eyes. At this period of its history it swims merrily about in the water. It takes some little time before the young crab grows to be at all like its parents. But, by degrees, it undergoes a series of changes, and leaves off swimming. It is now, in fact, a true crab, and is ready to set off to the mountains. Then the roads, far and near, are sprinkled over with little crabs scrambling along as fast as they can, and led by that wonderful guide—Instinct. Dangers beset them on every side, and birds and animals alike feast upon them. But the little army still pushes bravely on, and at length a remnant of it reaches the mountains in safety.

Fishes do not care about their young ones. They lay their eggs in the water, and leave them to hatch, without taking any trouble. This is their usual habit; but there are a few exceptions to the common rule. There is a fish called the hassar. It lives in America, in pools and streams. And when its pool dries up, it sets out to find another. It has the sac of water under its gills, so it can travel on dry land, and bear the heat of the sun. It builds a nest for its young. In the fine spring weather, it begins to make its little house which is like a hollow ball, flat at the top. It is made of the fibres of the rushes and the water-plants. It has a hole, through which the fish can get in. People who wish to catch the fish hold a basket to the hole, and begin to beat the nest with a stick. The fish gets very angry at being disturbed. It spreads out its hard fins, with their sharp points, and gives a spring forward. Then it falls at once into the basket, and is caught.

There is an active little fish that lives on our own shores, and has fins on his back. He is called the stickleback, and also the thornback. He takes all the trouble from his partner, for he makes the nest himself. He twists bits of sea-weed and corallines together, and glues

THE WONDERFUL NEST-BUILDING FISH.

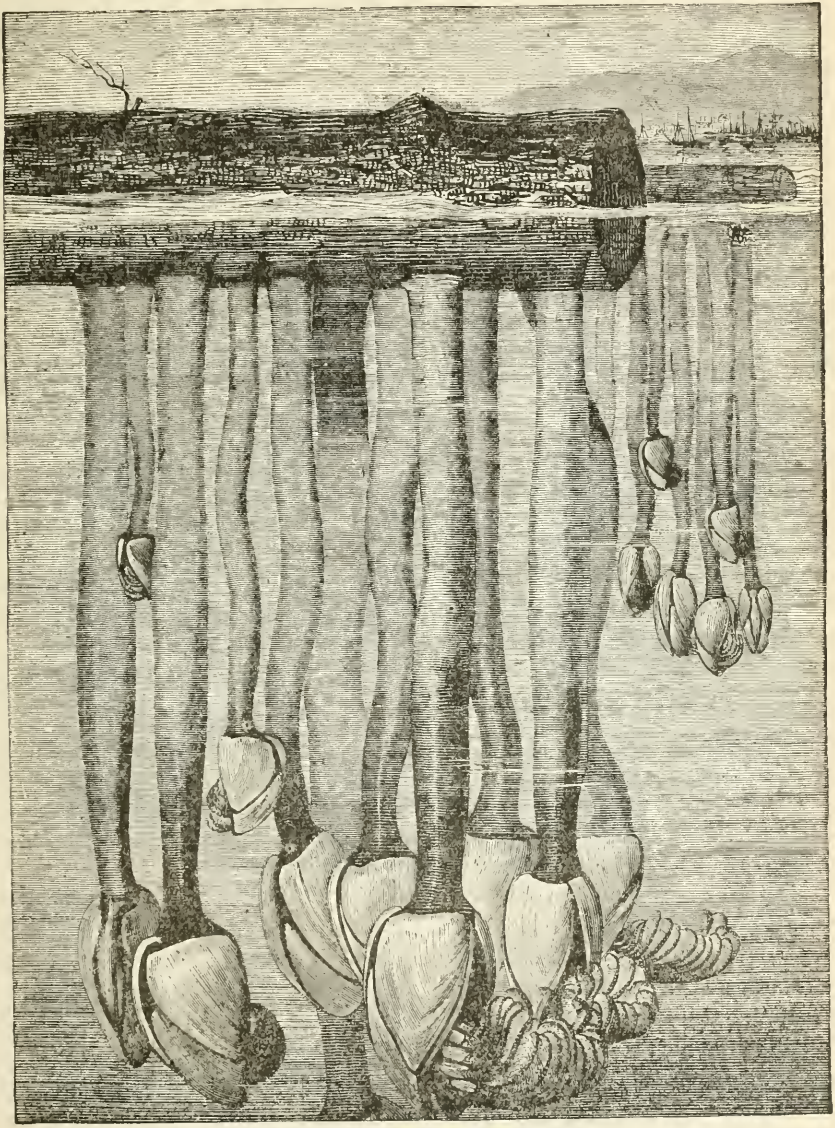


them with a gummy matter, that Nature has given him, and that comes out like a thread. The nest is in the shape of a pear, and has a way out and a way in. It might be said to have a front door and a back. The fish takes a great deal of pains with his nest, and will alter it over and over again before he gets it to his mind.

When the eggs have been laid by the mother fish, he keeps guard over them. And when an enemy comes near, and wants to devour them, he darts out and pushes him over. Naturalists are very fond of watching the stickleback taking care of his young. They say it reminds them of a hen and her brood. If a young fish ventures too far from home, the stickleback swims after it, seizes it in his mouth, and carries it back again.

It requires a good deal of faith to believe that barnacles are related to crabs, for they are not the least alike, and the first is fixed like a shell-fish on to pieces of timber floating about in the sea, or to the rocks washed by the tide; whilst the last has legs, claws, eyes, and the power of moving and swimming. Yet it is quite true that the barnacle belongs to the same class of animals that includes the crabs, shrimps, and lobsters. If a piece of rock is put into a large glass full of sea-water, many things may be seen on it which are of a white color, and whose shape is something like that of a thimble with the top battered in. If they are examined, it becomes evident that the conical outside is formed of several little bits of hard shell joined together very carefully, and that the top has a valve in it. When the water is quite clear and quiet, a small flapper is poked out through the valve, and is moved to and fro with a motion like that of opening and shutting the fingers. The flapper has some long bristles attached to it, and they are beautiful, feathery-looking things when examined under a microscope. The movement goes on for hours, and ceases upon the least alarm. Then the flappers are withdrawn, the valve closes, and the barnacle—for such is the creature—looks again like a conical piece of stone. The flappers are the lungs as well as the hands of the barnacle, and minute living creatures are entangled by them and passed by a current of water into the mouth, which is within the shell. When the barnacle produces its eggs, it ejects them with a stream of water, and they float about in the sea, being very minute things. They soon become hatched, and then it is that the reason becomes clear why barnacles and crabs are placed by zoologists in the same class.

The young barnacle is just like a shrimp, with a long body, many long legs close to its head, and a large tail; it has eyes, and swims about most vigorously. It appears to be constantly in movement, and although actively employed in swimming and in crawling, it does not care to seek for food. After awhile, the young free-swimming creature rests upon a piece of rock, or wood, or even on the back of a fish, and



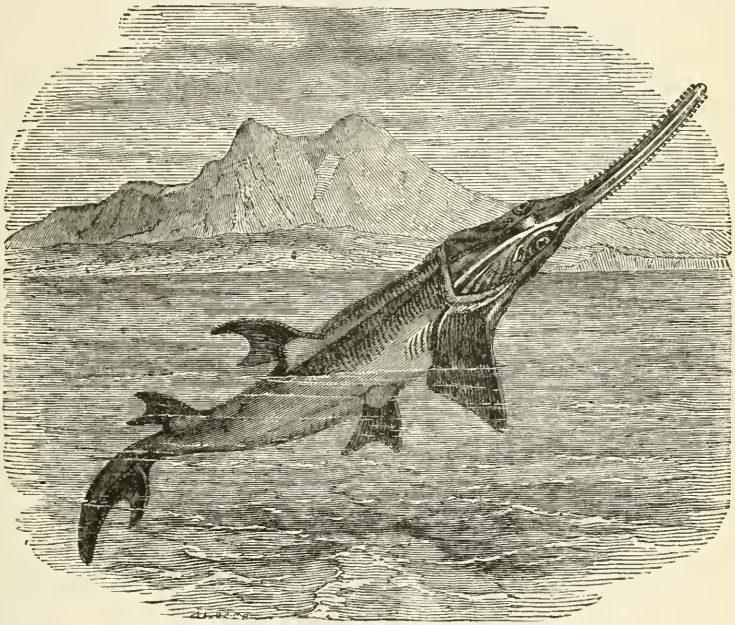
THE CURIOUS BARNACLES.

then a wonderful alteration takes place. The long legs and feelers near the head grasp the substance on which the creature is to live for the future, and a gummy substance comes from a gland which has been growing for some time close to the head. The gum sticks the legs and the feelers to the substance, the eyes diminish in size and are no longer seen, the tail and the hind legs grow into the feathery flappers already noticed, and the shell of many pieces encloses all. The barnacle is then fixed for life, head downwards, and it loses its organs of sight and receives a mouth and stomach, which it had not before, when in the free-swimming state. All barnacles do not undergo this change, for the males of some kinds live inside the conical house which holds the female, and never have houses of their own, for they remain in the free-swimming form. All the animals of the crab class have to undergo a change of form before arriving at maturity, and the common shore crab, when it is first hatched, is a long thing with a great head, and legs fitted for swimming, and not for crawlng. As it grows, the body shortens by curling the tail end underneath, and the legs and claws grow out of the swimming apparatus. Some of the barnacles that live on coral reefs are very beautiful, and their shells are ornamented in imitation of the flower-like polypes of the stony madrepores, which they resemble.

THE SPONGE AN ANIMAL.

Among the wonders of the sea there is none more remarkable than the common sponge. For a long while it was disputed whether the creature belonged to the animal or vegetable world, and until quite lately the opinion prevailed that it was a subject of the vegetable kingdom. Modern science has ascertained that sponge is beyond all question an animal production—not the work of any highly organized animal, but still of creatures distinctly animal. Sponge, as we commonly see it, is an intricate network of filaments of a horny substance, and solid, having here and there in their midst caverns or cells, into which the passages that honey comb the sponge converge. Imbedded in these filaments are numerous tiny, needle-shaped pieces of calcareous matter, with a knob at one end and a point at the other.

Here is an abode in which dwell, not crabs or fish, or anything of their respective kinds, but an infinity of small gelatinous cells, each one possessing a perfectly independent existence, and able, when detached from its fellows, to move onwards by the extension of its substance. There are many different sorts of sponge; some of them inhabit our own coasts, some live in fresh water, but the finest specimens of the best kinds of sponge are to be found in Tropical waters, in the Mediterranean, in the Grecian Archipelago, in the East and West Indies. The most valued sorts are found at some depth below the water, and must be dived for, as they never allow themselves voluntarily to appear above the surface. They anchor themselves to any good holding-ground that comes in their way—a branch of coral, a jutting piece of rock, anything that happens to be convenient. Mention is made of a large sponge being found attached to the back of a living crab. Sponges resemble coral in this, that when exposed to the action of a rough sea they become larger and thicker, and grow more rapidly than when in situations where the conditions are gentler—a fact which is perhaps due to the frequently-changing medium which brings at every turn and roll a fresh supply of food for the gelatinous aggregation of cells which is the true sponge, and a fresh supply of material to strengthen the horny fibres and spicula which are the skeleton and framework of the sponge animal, requiring nourishment.

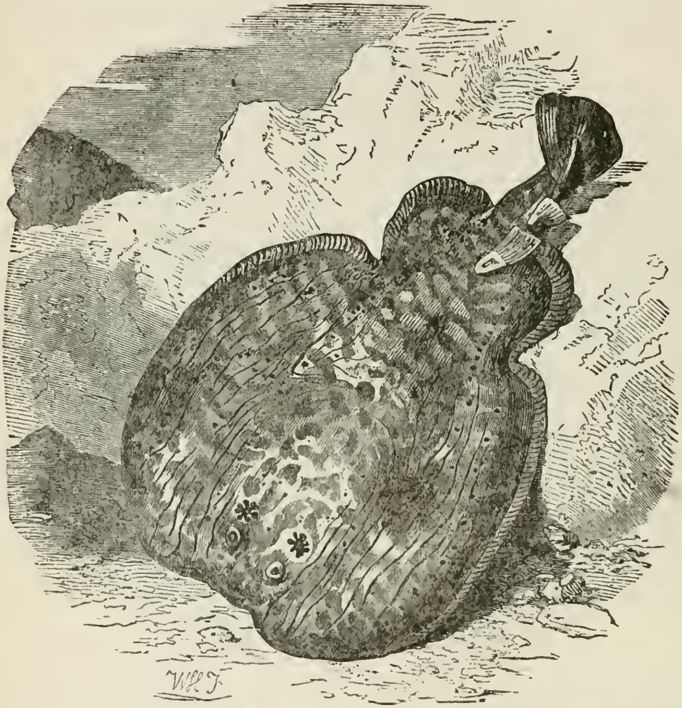


A FISH WITH AN EXTRAORDINARY WEAPON.

Some sponges have a regular shape, as a cup, globe, or tree; while others grow, as it were, anyhow, covering the rock, shell, or whatever else it may be to which they are attached with a formless cover of soft spongy material. If two sponges of different kinds meet in their wide home in the depths of the sea, it is not found that they ever unite, nor do they ever cross the breed. A mechanical union there may be, nay, there often is; but so far from any disposition to unite having been seen, experience declares that disunion is the invariable rule. No matter how much the sponges may be interlaced and intertwined, they remain ever distinct and distinguishable, preserving their own individuality as closely as any of the higher forms of life.

Certain sponges have the faculty of boring into substances of which the hardness would seem to defy any but the best mechanical contrivances. Shells, coral, rock, are pierced with surprising facility. The sponges bore their way into the rocky substance, maintaining their communication with the water, and by continuous attacks disintegrate the mass, so furnishing rubble and small stones for the building which other handicraftsmen of the ocean are perpetually rearing.

There is a fish related to the sharks, that has a terrible weapon. It is called the saw-fish. It is furnished with a long saw, jagged at both edges. Its body is covered on the upper surface with sharp spiny knobs, a little like the rays. It is as savage as its relation the shark, only, happily, it is not so often met with. It attacks the whale, as the sword-fish does, and will bury its weapon in the huge animal up to the very roots. It will also plunge its saw into the side of a ship. You would wonder how the edges of the saw could be forced through either the whale or the ship. But the fish comes to the attack with such violence that nothing can resist the shock, or withstand its fury.



THE REMARKABLE ELECTRIC FISH.

There is a fish that has a mysterious and powerful weapon of defence.

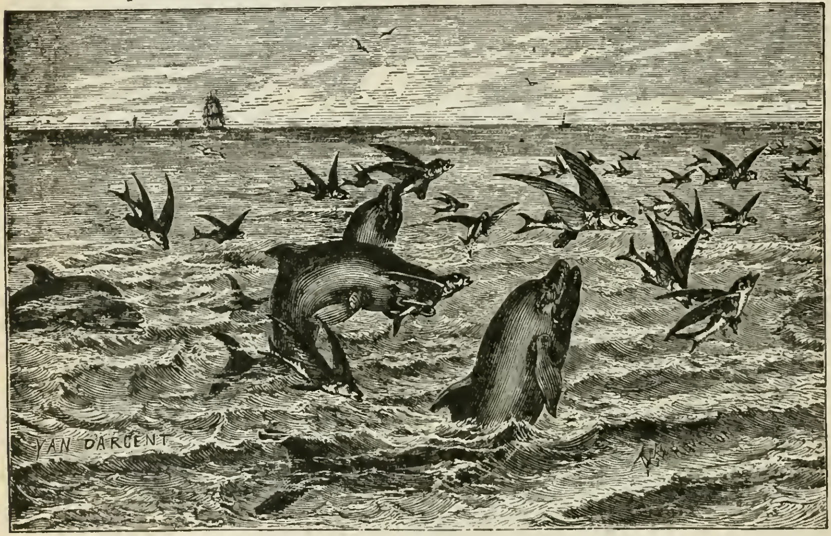
It lives in the Mediterranean Sea, and is called the torpedo. The electrical eel can give shocks as powerful as an electrifying machine. The torpedo has the same power of giving a shock, but it is much more feeble. The torpedo has a clumsy body, in shape a little like a musical instrument. The machine Nature has given it, and that produces the shock, is very curious. It consists of a number of tubes, and is not unlike a piece of a honeycomb. The tubes take up the whole length of the body, between the upper and under surface, and a secretion of thick mucus is found in them.

The torpedo is very much dreaded by its neighbors in the sea. It feeds upon fishes, and whatever it can find, and uses its machine to stun its prey. In the warm seas of the Tropics very large torpedoes are found. If you were to touch one it would give you a curious sensation. You would feel as you do when you give your elbow a blow against some sharp corner. The torpedo is a sluggish creature, and likes to bury itself in the sand. This is just the time when it is most to be dreaded. If an unlucky person were to disturb it by accident, it would give him one of its most angry shocks. In these days a great deal is said about electricity, and the doctors are trying to make use of it to cure many complaints. But so long ago as the days of Antony and Cleopatra, the torpedo was used as medicine too. Its shocks were thought to cure pains in the head, and various other maladies. And in later times, if a man had the gout, he was told to put his foot on the torpedo, and to keep it there, until he felt a sensation of being numbed, as high up as his knee. Electricity is a very ancient remedy.

RAINBOW COLORS OF THE SEA.

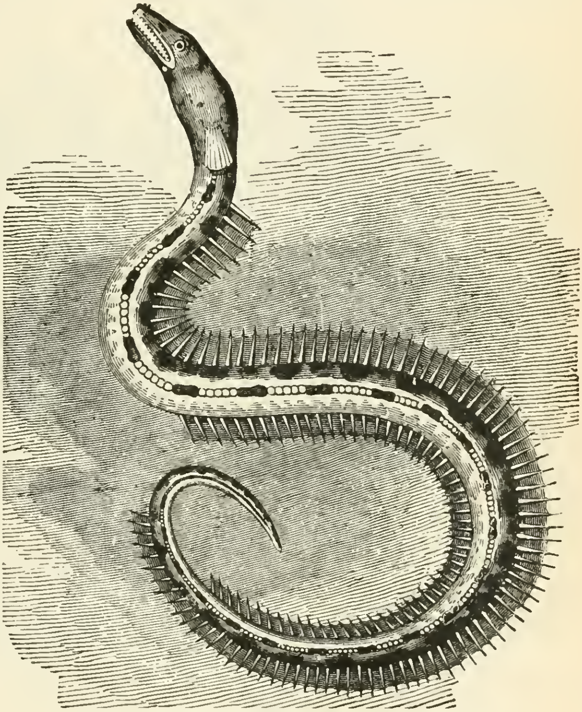
There is a very beautiful sight often visible at sea. Ships appear to sail through an ocean of color. There are streaks of red, and blue, and crimson. When the vessel moves, there seems to be fire issuing from her sides, and rolling along the water. Sometimes a troop of dolphins are seen playing about among the waves. The effect of the shower of light which falls from their shining scales, is very beautiful indeed. Each drop of water sparkles like a gem. What occasions all this glorious show of light? The presence of a substance which is widely spread through the regions of nature, called phosphorus. Phosphorus is a deadly poison, and when it is seen by itself, separated from the bodies in which it lives, it looks like a little white stick of a waxy nature. People who sell it keep it in water to prevent accident. When it is taken out of the water it begins to smoke, and after a time to burn. The slightest friction makes it burst out into a flame. Now, this burning, inflammable substance shines, in the dark, like fire, and it is this which makes the sea shine. But how came it in the sea? Because it exists in the bodies of millions of creatures that live in the water. Some of these creatures are so tiny, that you could not see them except through a microscope. But when myriads of them are together, they have a splendid effect. They make streaks and bands of light. Indeed, they seem as if they had set the waves on fire.

The waters of the sea, in different places and at different times, present almost every hue of the rainbow. Apart from the influence of the condition of the atmosphere on the light reflected by the ocean, there are seas which always present one shade of unusual color. Thus there are the Yellow Sea of China, the Vermilion Sea of California, the Red Sea, the Black Sea, and others. The hue of the last named is attributed to the frequent storms which agitate its surface, and the quantity of earthy matter brought into its bosom by the Danube and other rivers. But the tinge of the Red and other colored seas is due to the presence of myriads of animalcules, while to the same cause is ascribed the "white water" of the Pacific Ocean. Seamen generally admit one conclusion with regard to color—that a green hue is a general indication of soundings, and indigo-blue a token of profound depth.



FISHES THAT FLY—DOLPHINS IN PURSUIT.

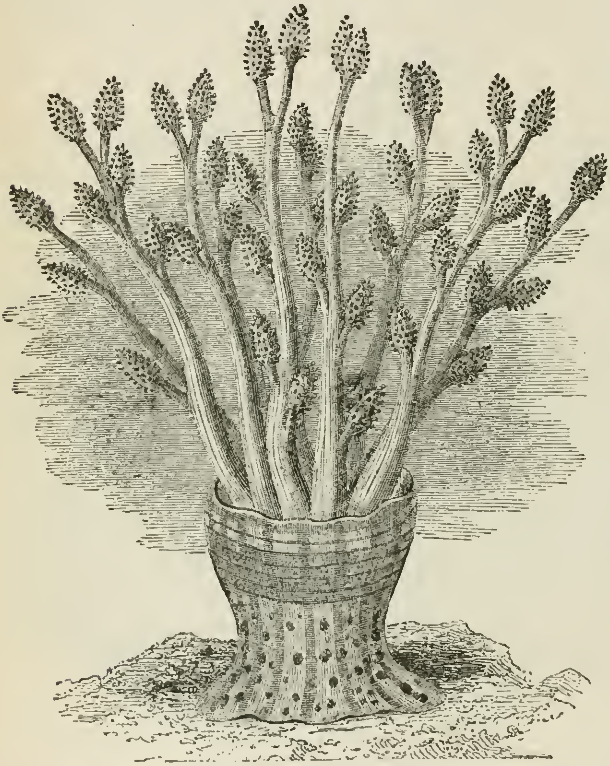
One of the surprising wonders of the ocean is a fish that can fly and give great jumps out of the water. The air-bladder of the flying-fish is very large. When it is filled with air, it takes up nearly the whole of the body. Its fins are very large, and almost like wings. They do not hinder it from swimming; when it is in the water, they are folded close to its body, and quite out of the way. When the fish takes its jumps, it not only expands its fins but its tail. It skims along a little like a swallow. Indeed, the ancient writers called it hirundo, which means a swallow. It can fly about fifty or sixty yards at a time, then it drops into the water, and moistens its gills. After that it can take another spring. The fish gives these jumps to get out of the way of its enemies. In the Tropics, a shoal of flying-fish is often seen springing out of the water. Their silvery fins, and blue bodies, glitter in the sun, and look very beautiful. But this plan of flying is not always a safe one. There are a number of sea-birds ready to pounce on the fish when it gets out of water. The gull and the great albatross are always on the watch. For, in Tropical seas, the birds abound in great numbers. Flying fishes are often pursued by dolphins. In vain they give their flying leaps out of the water. On board ship, people amuse themselves by watching the flying-fish. If a light is brought, a shoal of them will drop on deck, attracted by it. The sailors think them a great delicacy, and say they are as good to eat as the best mackerel.



THE WORLD-RENOWNED SEA-SERPENT.

There is an inhabitant of the ocean which is of such a size and so closely resembles a serpent, that it is not surprising it should be a perpetual sensation and source of wonder and fiction. Its body is as thick as a man's arm, about six feet long, and it has a kind of snout. Its colors are brown on the upper part, and a silver-white beneath. It lives in the Mediterranean Sea, but has relatives in other waters. It does not approach, in any degree, to the fabled monster which goes by the name of the Great Sea-Serpent. Yet, in form, it is as much like a snake as can be. There is an eel in the Mediterranean Sea which the old Romans had a great fancy for. They used to keep it in fish-ponds near the sea-beach, and prize it as we do gold and silver fish; only that we do not eat the gold and silver fish. But the Romans used to eat the murey. They thought its flesh a great delicacy. Julius Cæsar, at one of his banquets, had six thousand mureys given away to his friends.

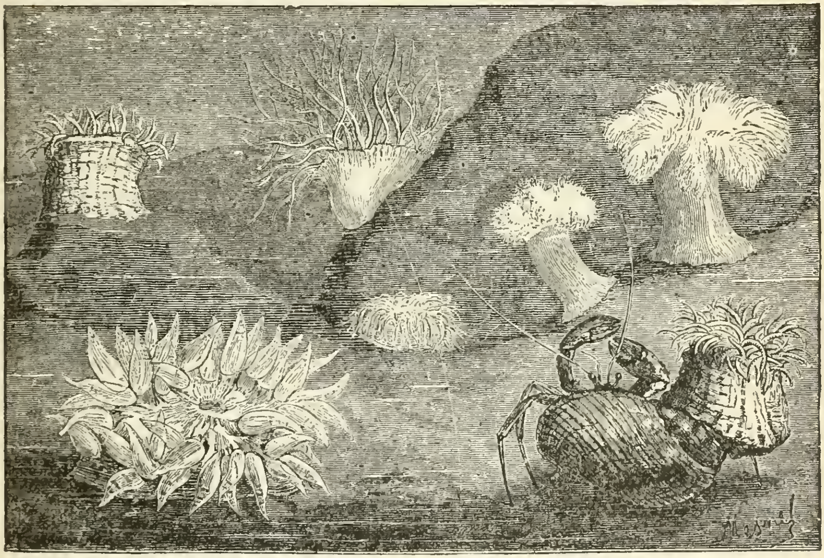
We who live on land, far away from the deep recesses of the ocean, can form little idea of its hidden beauty. Branching corals, and fantastic shrubs, and brilliant sponges, are on every side. Sea-weeds cling to the corals, and wreathe them with gold and purple. The rocks are gay with flowers of ocean, that vie in loveliness with the lily and the rose. Bell-shaped jelly-fishes float amid the fairy scene, dressed in violet and crimson. Ribbon-like creatures glide about, and cross and re-cross each other, while brilliant-colored ones flash among the plants and corals, as humming-birds do in the groves of the Tropics. When night comes, the ocean-garden is still more beautiful. Millions of tiny creatures sparkle like stars. The larger animals look, many of them, like bodies of fire. In the day-time, they had no especial beauty. But now, they shine with gold or emerald. The ancients, who were very fanciful, might well people these fairy-like spots with sea-nymphs, and mermaids, and imaginary beings! They are not real flowers, but animals. They have been called plant-animals, because they are so like plants growing in the gardens of the sea. Their proper name is zoophytes, and they belong to the large family of polyps. The polyps that were makers of



TREE-LIKE ACTINIA.

islands, lived each in his cell, and did not roam about. These ocean-flowers can, and do move, though slowly. They grow each on its stalk, and are called sea-anemones, a very remarkable production.

Though it is in one of the lowest ranks of the animal world, you will find a great deal about the sea-anemone that is very interesting. Its body has six parts, or, if you like to call them so, members. First, there is the stem, or column. It rises like the stem of a plant, or the trunk of a tree. At the top, it is cut off, as it were, and there is a thick margin, or, as it is sometimes called, parapet or wall. Sometimes this wall is plain, and sometimes notched, or the outer row of feelers may grow to it. Sometimes the column is smooth, or marked with lines or furrows, or else wrinkled like the bark of a tree. Or it may be fleshy, or else like leather, or soft as pulp. There is no end to its varieties. It may be covered with little knots or warts. These warts are, in fact, suckers, by which it can stick fast to any substance it chooses. The lowest end of the column is the base. It is a broad plate, forming a flat surface, by which the creature fixes itself. The upper end of the column is called the disk. It is round, and sometimes its edge has a frill, or number of frills, round it. The feelers grow out of the disk. These are hollow, and are arranged in circles, round the edge of the disk. Each feeler has a foot, and a tip. A great deal of work is done by these feelers. The anemone has neither eyes nor ears; but it has a mouth and a lip. The mouth is placed in the middle of the disk. The thick



SEA—FLOWERS—HERMIT CRAB CARRYING ONE ON HIS BACK.

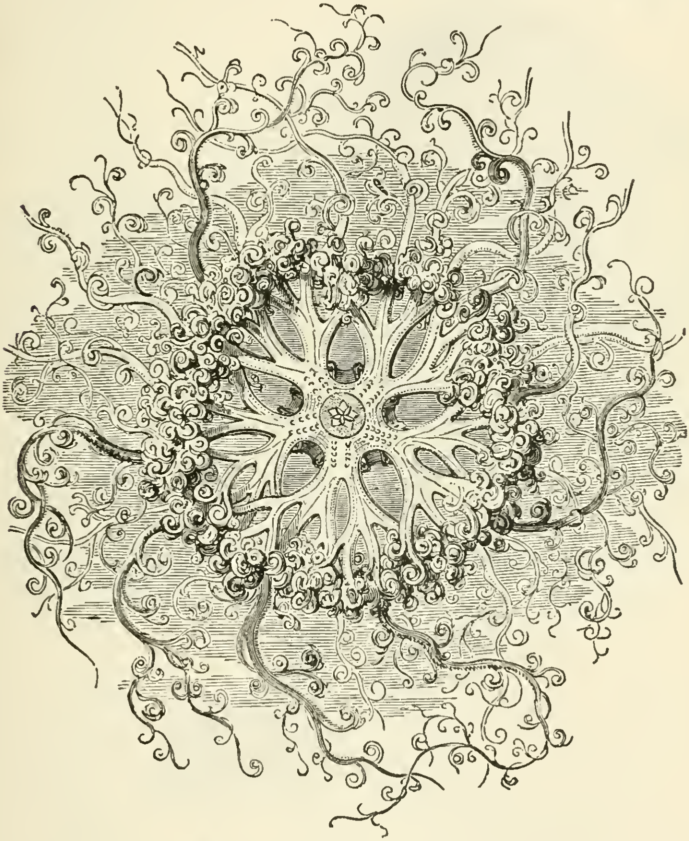
lip goes round it. From the mouth, there descends a hole or cavity like a sac, only gathered into folds. It is open at the end and forms the stomach. Indeed, the stomach takes up the whole space within the column, and is divided into rude kinds of chambers or spaces.

Thus the structure of the sea-anemone is very simple. It has a column, a base, a disk, a mouth, a lip, a stomach, and a number of feelers, yet there is scarcely the appearance of organization. It likes to live among the rocks in some hole or crevasse. Here, it will unfold its crown of feelers, as a flower does its petals, and wave to and fro in the water. Its crown will not always be of the same color as the stem. It will be pale orange, or red, or white, or pink, or yellow. In fact, the anemone will be variegated, and wear all these colors at once. How beautiful it looks when fully expanded! How brilliant are its colors! But touch it ever so lightly, and all its beauty is gone. It draws in its feelers, and shrinks down to a button, or little knob of jelly. It is now ugly and disagreeable to look at. But let it alone, and its courage will begin to revive. It gradually rises, and its body gets filled with water. The column-like stem swells out, and the frilled disk unfolds like a crown of leaves. It will soon become as beautiful as ever. It is not merely going to display its beauty, in this pleasant nook it has chosen. It is a hungry creature, and is watching for its prey. A foolish worm comes swimming by. The anemone has no eyes to see it; but its feelers have been moving about, in the hope of meeting with something which is likely to serve for a dinner. They quickly close round the worm, and the anemone feasts like a king, then seeks another meal.

THE WONDERFUL STAR-FISH.

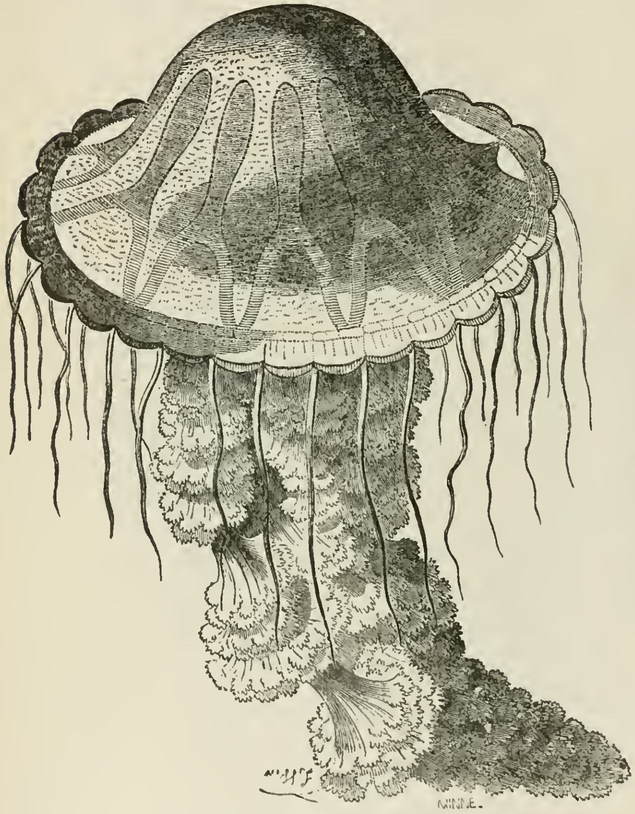
The brittle star-fish, one of the most marvelous creatures that floats in the sea, has long arms which are like the tails of serpents. These arms are so easy to bend about in all directions that the creature can use them as legs to crawl, or as fins to support itself in the water. When its prey happens to come near, the branches hook it, and draw it, as in a net, to the mouth. The arms are long and thin, and each springs from the body quite separately from its neighbor.

The body is made from a number of pieces fitted close together, with the utmost nicety. The mouth is surrounded by furrows or grooves, in which are some tiny holes. Through these holes, minute bodies, called suckers, can be pushed. They can take hold of any object, and keep it in a firm grasp, or they can help to retain the food of the animal while it is being digested. These star-fishes, with their snake-like arms, are very beautiful. Their bodies are all kinds of tints and hues, and it is very seldom that two of them are alike. But the whole race of brittle star-fishes give the naturalist a great deal of trouble. The creature has the art of breaking itself up into pieces. The moment it is touched, or even approached, it begins to fling off, first one arm, and then another, till scarcely anything is left. Often the fisherman will bring up a number of these creatures in his net. They will twist about and put themselves into such strange attitudes, and fling their arms about them in so reckless a manner, that he will shovel them back into the sea. The naturalist, who wants to save a specimen for his collection, has but one way of proceeding. He must plunge the brittle star-fish into a vessel of cold fresh water. This will kill it at once, before it has time to get rid of any part of its body, and circumvent his efforts.



THE WONDERFUL OCEAN STAR-FISH.

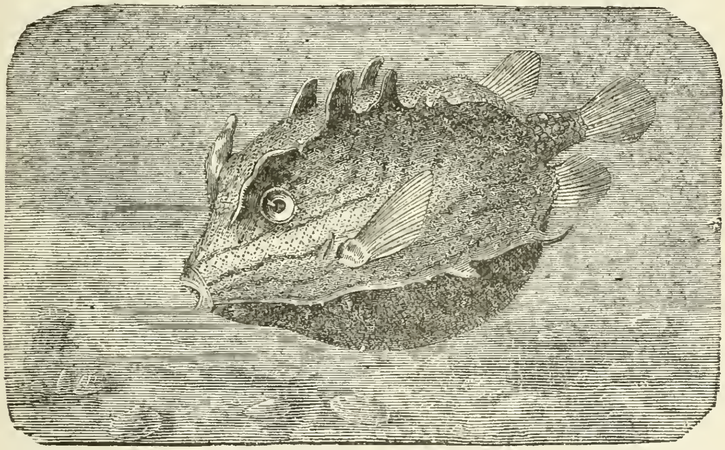
But even then the creature will often be too quick for him. He will slowly and cautiously approach, and lower his bucket of fresh water. But before he has time to do more, the brittle star will begin to break itself up. First will go one arm, and then another, till the naturalist will seize hold of such parts as he can get, and carry them away, in despair of obtaining a more perfect specimen.



THE FINE-HAIRED MEDUSA.

It is rather inappropriate to give the name Medusæ to the lovely fairy-like creatures bearing that name. For Medusa was one of the Gorgons. She was said, in the Greek mythology, to be a beautiful woman, with snakes growing round her head instead of hair. And, according to the same old story, whoever looked at her was turned into stone. The Medusæ here spoken of are a tribe of creatures that have all kinds of shapes, and wear all kinds of colors. They float about in the sea, and are as transparent, sometimes, as the water. Most of them, if not the whole of the family, have the power of shining in the dark, and they help as much as any other creatures to make the sea shine. When they are thrown on shore, they look like a mass of jelly or blubber. As the Medusæ have the disagreeable art of stinging very sharply, they are often called "sea-nettles." There is something very extraordinary in the history of these creatures. What animal life or structure can there be in a creature so imperfect? Let us look at it more closely, before we decide that question. Its body has nearly drained away. What is there left? A little quantity of transparent matter, almost like cobwebs, and full of cells. This is the framework or body of the creature, the only kind of skeleton it has. From the inside of the top disk there hangs down what might be a stem, divided into parts, and looking a little like the roots of a plant. The stomach, a very hungry one, is placed in the centre of this stem. The edge of the disk or umbrella is provided with long streamers of its own, that float about in the water, and are a little like the snakes of the Gorgon's hair. The opening to the stomach is the mouth, which is ready to receive whatever comes in its way. But the Medusa itself serves as food to the larger animals that live in the sea. The great whale feeds upon some species, for the family is very large indeed, and includes all kinds of varieties, in size, and shape, and structure.

One of the globe fishes is called Pennant's globe-fish, because it was discovered by a famous traveler of the name of Pennant. It has a crop a little like the crop of a fowl, which is one of its stomachs. When the fish is alarmed, or in a passion, it puffs out this crop like a balloon. Then it turns over and floats on its back. While it is in this distended state it loses all power of guiding itself, and is drifted about at the mercy of the waves. But its prickles all stand up, so that it is really fully armed, and dangerous to any creature that approaches it.



THE STRANGE COFFRE-FISH.

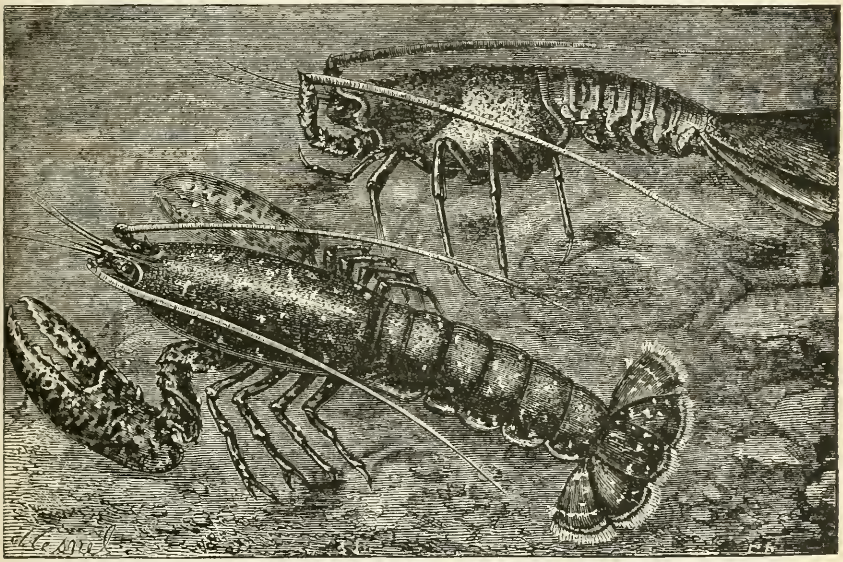
When it wants to empty the air from its crop, it lets it off by degrees through the mouth and gills, making, as it does so, a rushing kind of noise. The fish puffs its body out and makes it a very odd shape, a little like a box with a lid to it. This is why it is called by the French the "coffre-fish." And it does not swim with its fins, as other fishes do. It seems rather to balance itself, and move from side to side, like a boat on the sea. The horny spines over its eyes and upon its back have a touch of poison in them. And in many instances the flesh of the fish will be poisonous as well. The natives of the countries where the globe-fishes are found, are careful never to eat them, and they warn strangers of their poisonous nature.

There is a story told of a sailor who was resolved to try, at all risks, and taste what the flesh of the fish was like. He thought it was only the curious shape of the fish that made it disliked. But when he had had the creature cooked, and had eaten it, he was taken ill and died, paying the penalty of his rashness and curiosity.

WONDERFUL CREATURES THAT WEAR ARMOR.

Nature does her work more skilfully than man. And she has made a whole race of creatures, who wear armor—armor that she has herself fitted upon them. Here we find shields, and bucklers, and lances, and spears ; weapons, you perceive, as well as armor. It is a good thing these creatures are not very large, or else they would be dreadful monsters, and as dangerous as dreadful. They belong to a class in the animal world which is called crustaceæ. The name comes from a Latin word which means "to harden." They have rings round their bodies, as the annelides have. But the rings of these armed creatures are made of lime, and there is no soft flesh between them. There is either a piece of tough skin, or else the rings are close together, and form a compact case or shell.

One of the most familiar of these creatures is our friend, the lobster. He has a soft body under his hard shell, for we have eaten it, and know that it is rather a dainty to all those who have a taste for it. He has a famous shield on his back, and his legs are cased in armor, like the rest of his body, but there are joints or hinges, so that he can move them easily. His armor is neither too heavy or two clumsy for him. It fits him like a glove, and allows him to go about just as he pleases. The lobster's coat of mail is possessed by the creature soon after his birth ; and here, rather a difficulty arises. As the lobster keeps on growing, in process of time the body of the animal becomes too large for his house. He is bound, and pent in, on every side. He leaves off eating, a sure sign that something is the matter. And he goes away and hides himself in some hole or corner. Here, he gets very thin, which is just the best thing he can do. His body shrinks away from the shell, and this makes what he is going to do more easy. Now begins the struggle The creature swells itself and wriggles about, till the old shell splits down the back and makes an opening. Then the claws burst at their hinges, and the lobster draws them off, as you would draw off a pair of boots. Next, the head throws off its covering or helmet, and then the body creeps quite out of the shell. The old shell lies complete in all its parts, and you might think the lobster was yet inside it. But the lobster, with his armor gone, creeps into some safe place. His brother lobsters would soon eat him up, if they met with him in this defenceless state. So he takes care to keep out of their way. He is very tired and weak, and, now and then, a lobster dies during the struggle of getting rid of his shell. Nature will soon provide him with a new suit of armor. His thick skin becomes covered with a kind of glue, and forms a new shell. All he has to do, is to fill his body with water, and swell it out as much as he can. The skin directly begins to get hard, and the new armor forms itself into the same shape as the old. The lobster recovers his appetite, and comes forth with new strength and vigor, apparently none the worse for his transformation.

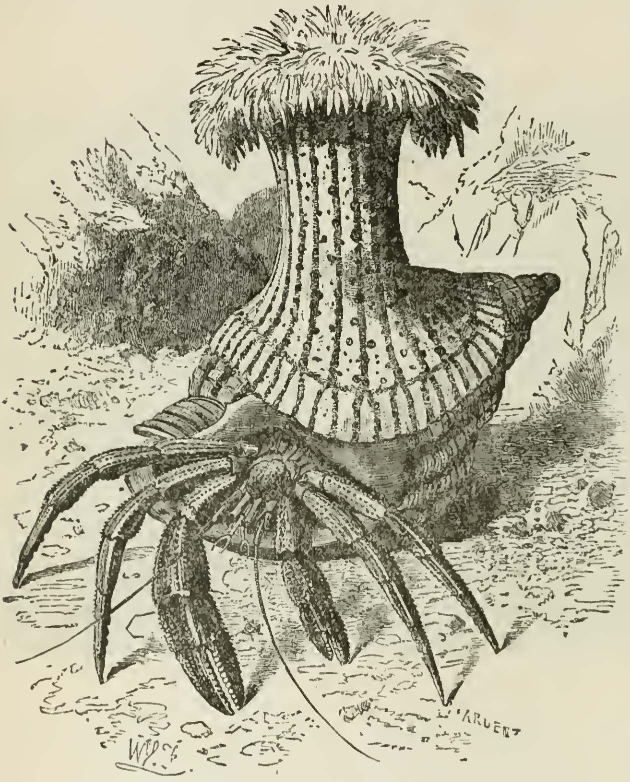


THE ARMOR-PLATED LOBSTER.

There is a family of crabs that nature seems to have neglected. The fore part of the body is armed, and has claws, but the hinder part has no covering at all. It ends in a soft tail. This creature cannot swim, like the rest of his tribe; and he cannot run. He seems to know that he is helpless, for he looks about to find some place of shelter. There are a great many shells on the beach. He picks out one that will do, and thrusts his tail into it. This serves him for armor. At first, he takes empty shells; but as he grows older, he gets more daring. If he sees a shell to his mind, he will not care whether it is empty or not. Indeed, he wishes for food as well as shelter.

As he prowls about, he will catch sight of a snail that has just put out its feelers. It draws them back in a hurry, the moment it sees the crab, and tries to get into its house again. But the crab seizes it with his sharp claws, and drags it out and eats it. Then he marches into the snail's house, and takes it for his own. When the crab outgrows his house, he casts it aside, and sets about looking for another.

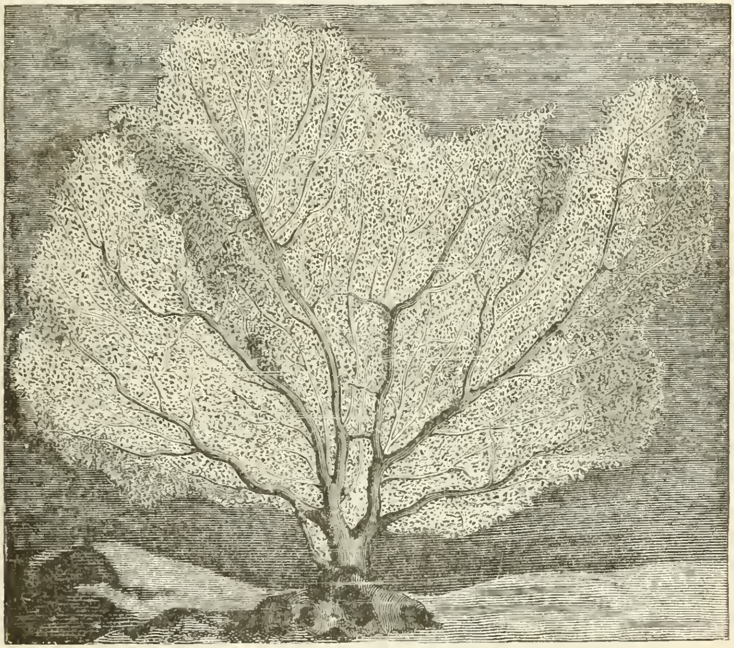
This hermit crab is very fierce and rapacious. But in spite of his fierceness, he often carries another creature on his back, and cannot get rid of it. The creature is one of those curious plant-animals, which are called zoophytes. The crab does not like to bear this burden, and makes great efforts to shake it off. But the zoophyte has fixed itself firmly on the shell of the hermit-crab, and sits there, quiet and contented until it pleases him to dismount and dismiss his steed.



THE HERMIT CRAB WITH HIS RIDER.

When a polyp lives alone in the sea, it is a feeble creature. United with its fellows, it is strong enough to build an island. Yes, and more than one island. Whole groups of islands have been made by the polyps. In the great Pacific Ocean there is a vast belt of sea, five thousand miles long, and fifteen hundred broad. This wide-spreading tract of ocean is studded with groups of the most lovely islands. They are called the South Sea islands. But another name is given them—Polynesia—a word meaning "many islands." By far the greater number have been built by the polyps. No rampart of the firmest rock could resist the action of the waves. It would in time be swept away and destroyed. Yet age after age the coral reef stands unhurt. It is, in fact, a living barrier. Millions of little architects are always at work, and at hand to repair an injury.

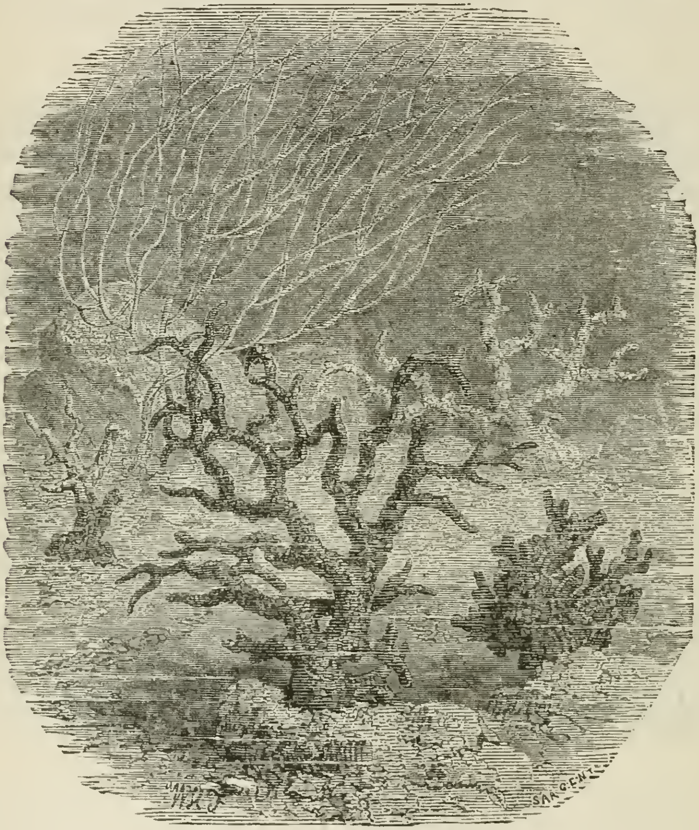
The coral-making polyp has a vast number of relations. And these are at work, in their own way, in the fields of ocean. This lovely fan-shaped coral is a marvel of its kind. The lower end is fast to some rock under the water, and the fan itself is stretched out, as though some sea-nymph were about to use it. The fan is but another kind of living house, or houses, where hundreds of polyps dwell. Like a beautiful leaf, it waves gently in the water; its surface covered with star-like polyps, whose bright heads are gay with all kinds of colors.



THE MARVELOUS SEA-FAN.

When the sea-fan is alive, and is waving about in the sea, a thick jelly covers it, the polyps make their cells in the jelly. But when it is taken out of the water, and the jelly and the polyps are gone, only the framework or skeleton is left. It looks then like a dessicated leaf, and even in what is left it is a most wonderful construction.

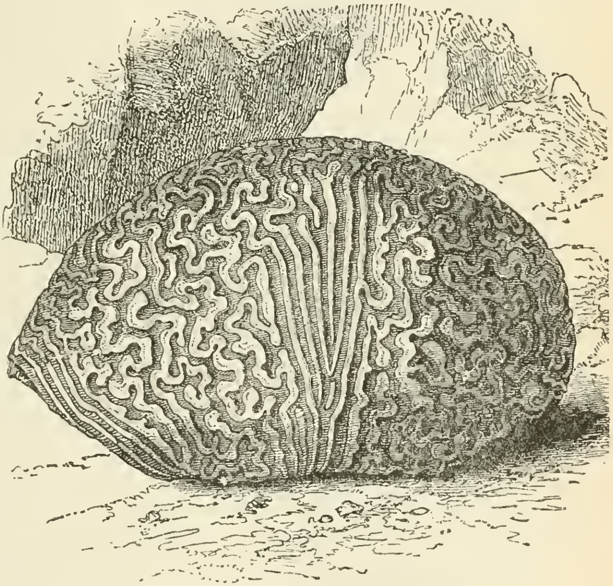
There is a dull, yellow-looking thing, like a piece of sponge, or of sea-weed, that is often thrown on shore. You might easily pass it by, as though it had no beauty or interest. But put the ugly thing into a vessel of sea-water, and it becomes alive with starry-headed polyps! They push their tiny heads through numbers of holes. In fact, the rough, ugly thing blossoms all over with these minute flowers. Each flower is a separate animal. If you touch the little heads, the polyps are frightened, and draw them in at once. Then the starry flowers vanish, and the coralline on which they live contracts, and has again the dull leathery look it had before. But when the little polyps have recovered from their fright, they push out their heads and suck in a quantity of water. Then the coralline swells out to more than double its size, and becomes quite soft and almost like a sponge. Its name is alcyonian, and it waves its streamers as ships' masts wave theirs.



A LIVING TREE—ALCYONIAN.

Sometimes a ship, as she sails among the islands of the Tropics, meets with a terrible danger; the little workers in the sea have been doing mischief. They have been making a great stem, or trunk, like a tree. On the top of the stem are a number of lumpy knobs, and that is called a brain stone. The brain stones are covered with thick flesh-like jelly, in which the polyps live. The polyps are called madrepore polyps, and are only met with in the hot seas of the Tropics. They work so fast, and their stony houses are so strong, that it is not at all pleasant to meet with them. They fill up many a space over which a ship is going to sail. On comes the ship, and before the captain is aware, it drives upon a rock.

The brain stone has twisted lines, or ridges, all over its surface. The polyps have their cells between these lines, and live in them as in so many valleys. They throw out the lime that makes their cells, in thin plates almost like sheets of paper. These plates, or layers, are arranged in a ray-like form round the middle of the cell, so that the madrepore head has a very curious effect. But it can only be seen when the structure has been raised to the surface of the water, and the polyps and the flesh-like jelly are gone. Then, the chalky ray-like heads are clearly visible. While the polyps are alive and at work, the madrepore rock or tree is gay with little rose-colored heads, that keep moving about, like flowers in the breeze of summer. The madrepore polyps build all kinds of fantastic shapes in these warm Tropical seas. Besides walls, and rocks, and trees, the structure will resemble a sheaf of corn, or a leaf, or a flower. There is no end to the strange devices of the little architects. The traveler on board a ship, will often gaze at these whimsical forms in wonder and admiration, as they glow, in all their beauty, beneath the waters.

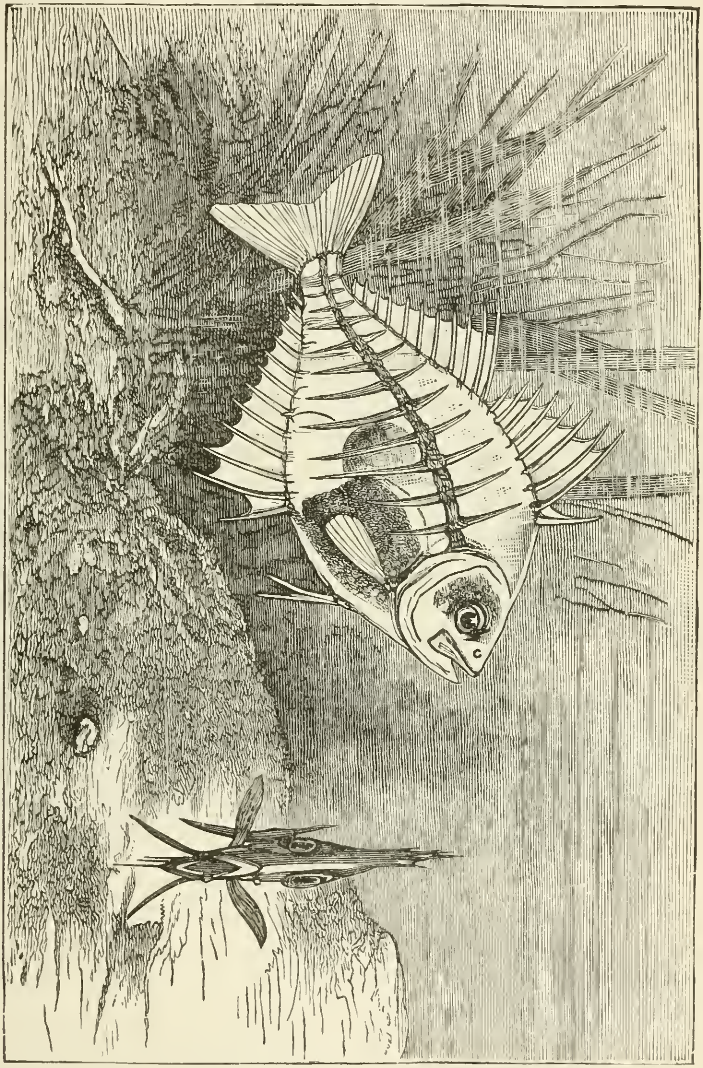

THE CURIOUS BRAIN STONE.

The jaculator fish of Java is a fine marksman. A traveler saw several of these fishes in the possession of a Javanese chief. They were placed in a small circular pond, from the centre of which rose a pole upwards of two feet in height. On the top of the pole, on sharp-pointed pieces of wood, were placed insects of the beetle tribe. When the slaves had placed the beetles, the fish came out of their holes and swam round the pond. One of them came to the surface of the water, resting there; and after steadily fixing its eyes for some time on a beetle, it discharged from its mouth a small quantity of water, with such force and precision of aim as to strike it off the twig into the water, and in an instant swallowed it. After this another fish came and performed a similar feat, and so the sport continued until they had secured all the beetles. If a fish failed in bringing down its prey at the first shot, it swam round the pond till it came opposite the same object, and fired again. The fish, in a state of nature, frequents the shores and sides of the rivers in search of food. When it spies a fly on the plants that grow in shallow water, it swims to the distance of five or six feet from them, and then, with surprising dexterity, it ejects out of its tubular mouth a single drop of water.

A few years ago, there was exhibited a wonderful "talking fish," as it was called, but it was, in reality, a seal. It measured twelve feet in length, and weighed eight hundredweight. It could stand on its tail, and overtopped its keeper. It was amphibious, and was a female seal. It was stated to have been captured on the coast of Africa. It had a fine dog-like head, and beautiful eyes, sparkling with intelligence, showing that what you said to it was understood, and seeking to communicate its reply. It was very docile, and would dance when bidden, rolling itself with great vehemence in its bath. It could say "Mamma" and "Papa," and could call its keeper by his name—"John." It could use its fins as hands and arms, and clasp them together in the attitude of supplication. At command, it presented either the right or left hand to the keeper. It was an Antartic species, and rare in museums. At night it reposed on damp boards, and the species can exist for days out of water; yet this specimen did not live long, and died much regretted.

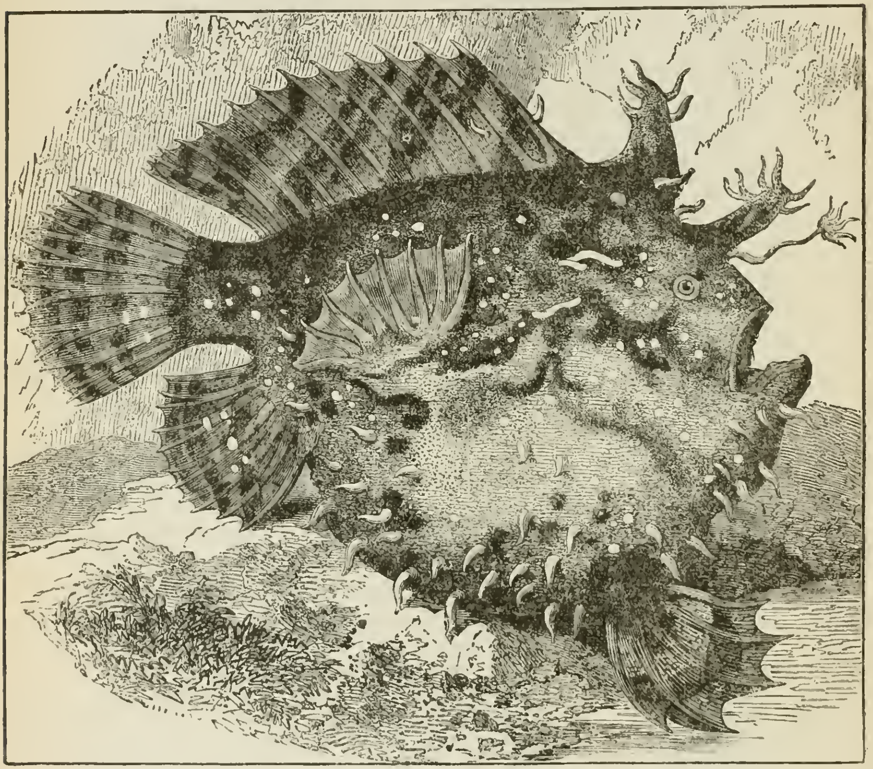
WONDERFUL GRATITUDE OF A FISH.

When the late Dr. Warwick resided at Durham, the seat of the Earl of Stamford and Warrington, he was walking one evening in the park, and came to a pond where fish intended for the table were temporarily kept. He took particular notice of a fine pike, of about six pounds weight, which, when it observed him, darted hastily away. In so doing it struck its head against a tenter-hook in a post (of which there were several in the pond, placed to prevent poaching), and as it afterwards appeared, fractured its skull and turned the optic nerve on one side. The anguish evinced by the animal appeared most horrible. It rushed to the bottom, and boring its head into the mud, whirled itself round with such velocity, that it was almost lost to sight for a short interval. It then plunged about the pond, and at length threw itself completely out of the water on to the bank. The doctor went and examined it, and found that a very small portion of the brain was protruding from the fracture in the skull. He carefully replaced this, and with a small silver toothpick, raised the indented portion of the skull. The fish remained still for a short time, and he then put it again into the pond. It appeared at first a good deal relieved, but in a few minutes it again darted and plunged about until it threw itself out of the water a second time. A second time Dr. Warwick did what he could to relieve it, and



THE WONDERFUL SKELETON FISH.

again put it into the water. It continued for several times to throw itself out of the pond, and with the assistance of the keeper, the doctor at length made a kind of pillow for the fish, which was then left in the pond to its fate. Upon making his appearance at the pond on the following morning, the pike came towards him to the edge of the water and actually laid its head upon his foot. The doctor thought this most extraordinary; but he examined the fish's skull and found it going on all right. He then walked backwards and forwards along the edge of the pond for some time, and the fish continued to swim up and down, turning whenever he turned; but being blind on the wounded side of its skull, it always appeared agitated when it had that side towards the bank, as it could not then see its benefactor. On the next day he took some young friends down to see the fish, which came to him as before, and at length he actually taught the pike to come to him at his whistle and feed out of his hands. With other persons it continued as shy as fish usually are.



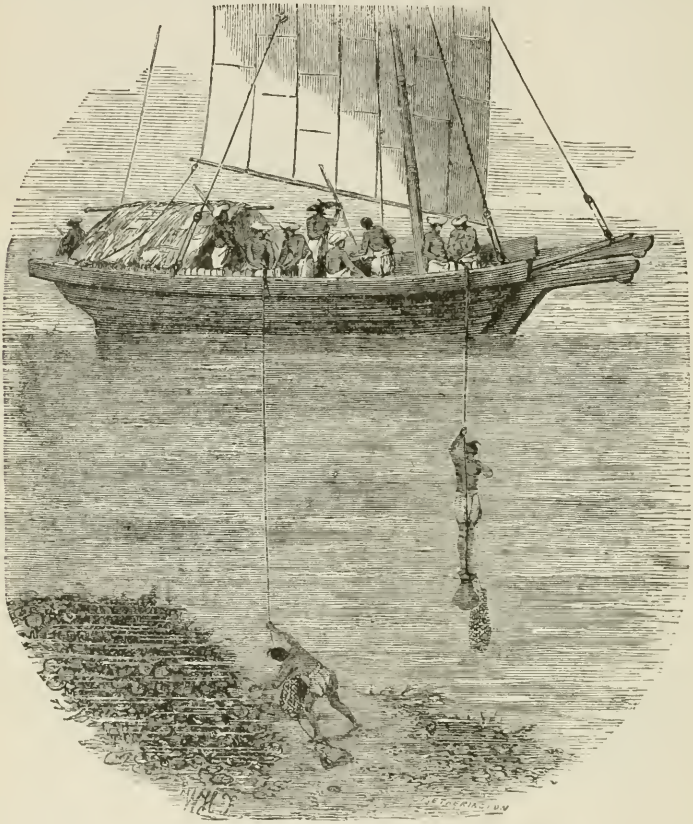
THE WONDERFUL SEA-PORCUPINE

There is a singular race of fishes chiefly inhabiting tropical waters. They are eminently noticeable objects, if for nothing else, for the horns they carry, and for the numerous horny spines with which their bodies are studded. There is one family of them which has teeth arranged in the jaw like those of human beings, but the special class now under notice has, in lieu of fangs, a horny covering to its lips and palate enabling it with special facility to grind the sea-weeds, crustaceans and small molluscs, upon which it is thought to feed. The color varies in different sub-genera. The commonest is black on the back and on the greater part of the body, with yellowish belly, the horny spines, both distinct and associated as fins, being of the latter hue. Some of the fish have a large air-bladder, which they can inflate at will. This power of distension, forcing the fish into a large globular form, furnishes a formidable means of repelling attack. The body being so blown out, the spines stand forth stiff and bayonet-like, before which many an enemy quails. When distended, the fish floats belly upwards, and looks one of the most helpless things imaginable. Mr. Darwin met one on the coast of Brazil which was able to bite very severely, and to throw water from its mouth to a considerable distance. Darwin adds that it emitted from the skin of its belly, when handled, a most beautiful carmine-red secretion, which stained ivory and paper in so curious a manner that the tint is retained with all its brightness to the present day. Some of these fishes are known as sea-porcupines, and a few are taken occasionally on the south-western coasts of England. Their flesh, however, is worthless. They are valuable only as curiosities.

A MARVELOUS TRAVELING FISH.

Some fishes are endued with the faculty of living out of water—of being literally fishes out of water—with apparently the greatest ease. Some species bury themselves in the mud of the ponds in which they have their local habitation, but which are apt, in the dry season, to become waterless. Others have been met going in troops from the dry bed of their late pond to some other pond in the neighborhood. The most remarkable specimen of the kind, however, is the climbing perch. This curious creature has a peculiar formation of the upper part of its head, by which, in a number of cells, a supply of water is retained to moisten the gills of the fish when absent on its travels. Frequently it quits its wonted pond for a considerable ramble inland; and it has been found so remote from water as to induce the belief that it must have fallen from the skies in a shower. The conjurers of India and China exhibit it, of course attributing to their own magical influence the natural powers of the fish, thus practising an easy deception on the credulous.

The pearl is nothing more than a pellet, varying in size, composed of the same shining, hard, calcareous matter, called mother-of-pearl, which lines the shells of many molluscs, especially those of the oyster and mussel tribes. They are found sticking fast to the lining whence they spring, or distinct in the bodies of the animals which produce them, lying loose in the substance of the animal itself, commonly in its thickest and most fleshy part. The cause of the production of the pearl is, in either case, some irritating influence acting upon the oyster itself. A grain of sand has insinuated itself between the soft mantle of the oyster and the shell, and to get rid of the annoyance the animal throws over it some of the calcareous secretion which it has power to exude, adding thereto in proportion to the amount of inconvenience it continues to feel. The pearls found in the body of the oyster or mussel are supposed to be abortive eggs which the creature has tried to throw out, but which, remaining, have been coated with additional nacre in order to render them less uncomfortable. The Chinese have several ingenious methods



NATIVES OF CEYLON DIVING FOR PEARLS.

for making the pearl yielders produce artificial pearls. They introduce into the shell of the creature small irritating objects—beads, nuclei of mother-of-pearl, metal knobs, any small thing, indeed, which the oyster cannot by any means get rid of, but finding it there proceeds to coat over with pearl. In the course of a year the secretion has been so considerable as to sufficiently remunerate those whose labor has been expended upon it.

The deep water fishery—that is to say, the fishery in about twelve fathoms—is conducted now pretty much as it was conducted in Columbus' time. Men accustomed from their infancy to an amphibious sort of life, and trained to be expert divers, go down naked into the sea in order to pick up the marvelous pearl-breeders which lie at the bottom. In Ceylon the pearl-fishers go out in company in their boats. The divers take turn and turn about at plunging, and remain under water for a minute and a half to two minutes. Some of them are said to be able to stay down as long as five minutes, but this power is exceptional, and only to be acquired by long practice. Trained to the work from childhood, the divers go down, with the greatest intrepidity, to a depth of from four to ten fathoms. To assist them in their descent, they use a large stone of red granite, having the smaller end bored so as to admit a rope, which is thrust through it. When about to dive, the diver seizes this rope with the toes of his right foot, and with the left foot secures a network bag for his oysters. He then takes hold of another rope with his hands and is let down from the boat to his diving-ground, the stone helping to sink him. When at the bottom, he casts himself loose from the stone, picks up his oysters, and when ready to return, jerks the rope by which he was let down, and he is then hauled up, leaving the stone to be recovered by its own rope, while he is safe at the top.

THE GULF STREAM.

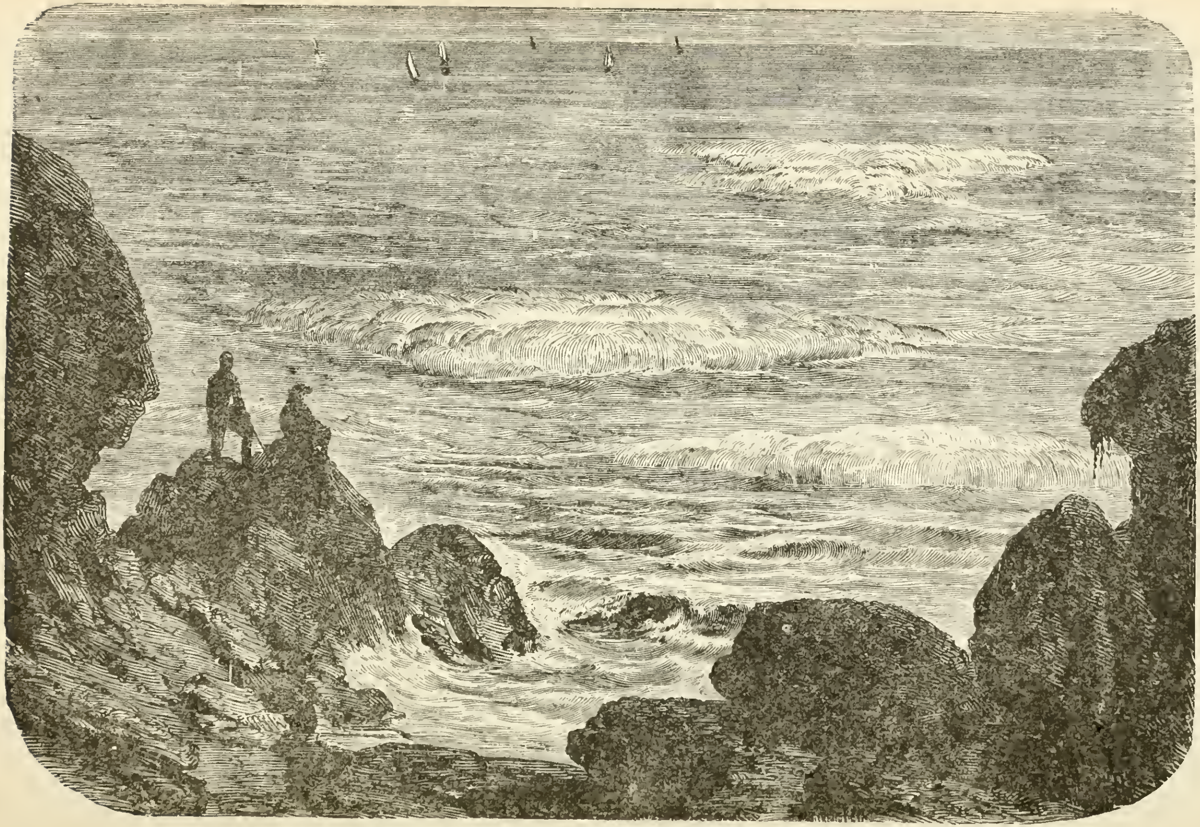
Among the wonders of physical geography, few are more interesting in their relation to this country than what is known as the gulf stream. This is an oceanic current of great extent, which takes its rise in the Gulf of Mexico, whence it derives its name. The peculiar formation and position of this gulf renders it a receptacle for the waters of the Atlantic, which sweep across the north-eastern coast of South America; and, on arriving in the gulf, they become warmed to a much higher temperature than is anywhere found in the surrounding ocean. The summer temperature of the waters in the gulf is about eighty-eight degrees, while in the open Atlantic, in the same latitude, it is only seventy-eight degrees.

Thus warmed, the waters pass out of the gulf northward, in a deep and strong current, through the coast of Florida on the one side, and the islands of Cuba and the Bahamas on the other. The stream progresses here with a velocity of five miles an hour. It rolls like a mighty river along the shore of North America, widening as it flows, until it nears the banks of Newfoundland, where it is turned aside, partly by the formation of the coast, which here projects boldly out, and partly by the encounter with strong and adverse currents from the North Atlantic. At the point where it is turned aside, it stretches almost across the Atlantic; the current itself, according to some, being about two hundred miles in width, and the warm waters of the stream extending in all more than twice that distance.

Crossing the Atlantic eastward, towards the islands of the Azores, the main stream gradually becomes lost and its current spent; but a portion of it continues northward towards the British Islands. The waters of the stream often bring cocoa-nuts and other tropical fruits to the shores of Europe. These warm waters mitigate the severity of climate to a considerable degree. While places situated in the same latitudes, both to the east and to the west, are frozen and comparatively uninhabitable during a large portion of the year, the British Islands, as a rule, enjoy a temperate climate; and this fact is attributed in a great measure to the beneficent influence of the warm waters brought down by the gulf stream. The peculiar verdure of the Emerald Isle, and the mildness of the seasons in its latitude, when Labrador and the regions round the Baltic are locked in ice, are the effects of an oceanic current which sets out more than four thousand miles away. And but for this, the river Mersey, which floats the commerce of England, would be frozen over during eight months of the year, shut against the world.

VOLCANOES UNDER WATER.

In November, 1867, a volcano suddenly began to show signs of activity beneath the deep sea of the Pacific Ocean. There are some islands nearly two thousand miles to the east of Australia called the Navigator's Group, and there had been no history of an eruption amongst them, nor had such an event been handed down by tradition. Most of the islands in the Pacific Ocean are old volcanoes, or are made up of rocks cast forth from extinct burning mountains. They rise up like peaks through the great depths of the ocean, and the top, which just appears above the sea-level, is generally encircled by a growth of the coral insect. Hence they are termed coral islands. These islands every now and then rise higher than the sea-level, owing to some deep upheaving force, and then the coral is lifted up above the water, and becomes a solid rock. But occasionally the reverse of this takes place, and the islands begin to sink into the sea, owing to a force which causes the base of the submarine mountain to become depressed. Sometimes



STARTLING EFFECT OF THE ERUPTION OF VERSUVIUS ON THE SEA.

they disappear. All this shows that some great disturbing forces are in action at the bottom of the sea, and just within the earth's crust, and that they are of a volcanic nature. For some time before the eruption, earthquakes shook the surrounding islands of the Navigator's Group, and caused great alarm, and when the trembling of the earth was very great, the sea began to be agitated near one of the islands, and vast circles of disturbed water formed. Soon the water began to be forced upwards, and dead fish were seen floating about. After a while, steam rushed forth, and jets of mud and volcanic sand. Moreover, when the steam began to rush up out of the water, the violence of the general agitation of the land and of the surface of the sea increased. When the eruption was at its height, vast columns of mud and masses of stone rushed into the air to a height of two thousand feet, and the fearful crash of masses of rock hurled upwards and coming in collision with others which were falling, attested the great volume of ejected matter which accumulated in the bed of the ocean, although no trace of a volcano could be seen above the surface of the sea. Similar submarine volcanic action has been observed in the Atlantic Ocean, and crews of ships have reported that they have seen in different places sulphurous smoke, flame, jets of water and steam, rising up from the sea, or they have observed the waters greatly discolored and in a state of violent agitation, as if boiling in large circles, with a tremendous fire beneath.

During eruptions of Mount Vesuvius, the waters of the bay of Naples are sometimes greatly agitated. The usually placid bay is made to boil, and throw up great clouds of mist and steam. This is a remarkable phenomenon attending volcanic action, showing its great power.

A WONDERFUL SOUNDING.

"They who go down to the sea in ships" do indeed "see the works of the Lord, and his wonders in the deep." Here is the narrative of a wonder told by one of those who was engaged for many years in a professional examination of the wonders of the ocean, and whose daily business it was to pry into the secrets of the great and mighty deep.

It seemed desirable to Captain Denham, when in command of the *Herald* on surveying service, to ascertain for himself whether he could not find a bottom to the bottomless sea. He chose a day when sea and air combined to produce such a calm as is seldom seen in the midst of the Atlantic, where he then was, half-way between Buenos Ayres and Tristan d'Acunha. Upon a great reel, rigged winch-fashion in the bow of the sounding boat, was the very deep sea lead line, one-tenth of an inch in diameter, and weighing, when dry, one pound per hundred fathoms. The plummet weighed nine pounds, was eleven inches and a half long, and one-seventh of an inch broad. Everything being ready, the plummet was let go. The first hundred fathoms of line cleared out in a minute and a half; the second in two minutes five seconds; and the time for every succeeding hundred fathoms increased gradually; so that, whereas the first thousand fathoms ran off in twenty-seven minutes fifteen seconds, one hour forty-nine minutes and fifteen seconds was the time required to get out the seventh thousand. After seven thousand seven hundred and six fathoms, or eight and three-quarters English miles, had run off, bottom was reached; the operation having lasted nine hours twenty-five minutes. That bottom was reached there could not be any doubt, the extreme stillness of the water enabling the sounders to perceive the same indications of touch as would have manifested themselves with casts in much shallower water. Again and again the line was tried, and stopped always at the same mark; several sets of hands tried the line, and each verified the report of their predecessors. The beat of the lead on the bottom was as distinctly felt as if an electric shock had been passed through the line.

We marvel at the hen, which will lay two hundred eggs in the year, but the eggs of a fish must be counted by hundreds of thousands. In every mouthful, the whale swallows thousands of the tiny mollusk, which forms its chief nourishment. Frequently on the coast of Greenland, the sea is colored for ten or fifteen miles in breadth, and one hundred and fifty to two hundred miles in length, with tiny medusæ. A single cubic foot contains one hundred and ten thousand of these animals, and such a streak of color must contain at least sixteen hundred billion of them! Among specimens of the animal and vegetable life at the bottom of the Atlantic Ocean, in soundings along the telegraph plateau, were found beings which secrete many chambered shells, each the habitation of a group of individuals so minute as to require the highest powers of the microscope to perceive and describe them.

THE EXTRAORDINARY SEA-CUCUMBER.

The sea-cucumbers are extraordinary looking creatures, which vary in size from two or three inches in length, to more than a yard. They bear some resemblance to a cucumber, being a long worm-like cylinder open at one end. Their exterior is ruffled with little projections, which are usually armed with minute sharp hooks, by which the animal can hang on to foreign bodies for a few seconds.

Many of the species are able to produce from their external pores a most irritating fluid, which causes the hand that touches them to itch intolerably. But the creature posseses a most wonderful power; when from any cause it fears death, it can eject all its teeth, its stomach, its digestive apparatus, and reduce itself to a simple membranous sac. Doctor Johnston kept one of these animals in an aquarium; for some reason or other he neglected to feed it, and when after some days he visited it, he found all its external apparatus thrown out on the floor of the vessel, and the holothuria itself was a shrunken, dilapidated and empty tube. Yet it was alive, and in three months had reproduced all its organs anew. Another singular property they possess is that of being able to divide themselves into two parts, each part becoming a separate creature. When this phenomenon is in progress, the middle of the animal begins to contract, and the extremities enlarge. This goes on until the centre is but a thread; at last it snaps, and forms two distinct creatures, which in time furnish themselves with all the necessary organs, and thus this curious creature is reproduced and multiplied.

WATERSPOUTS AND THEIR FREAKS AND DEVASTATIONS.

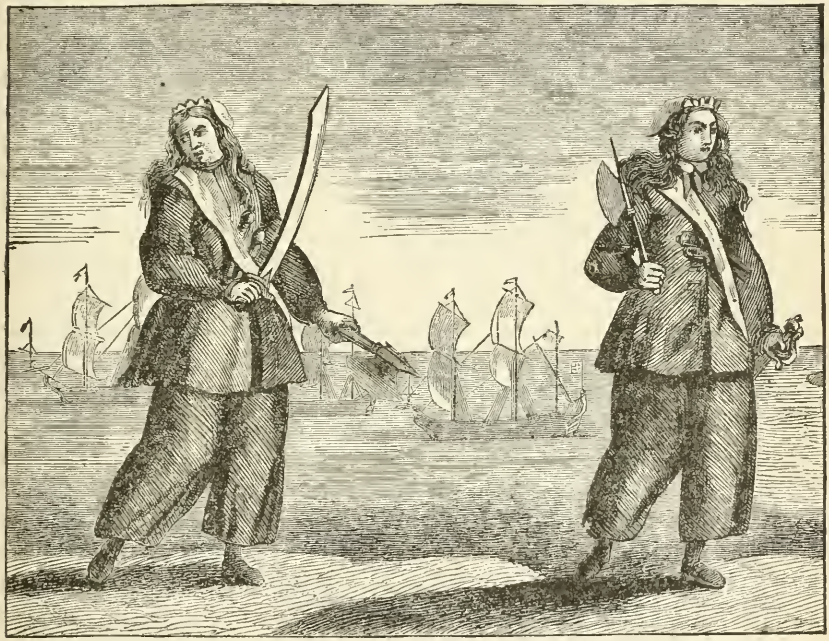
Waterspouts are among those curious phenomena of nature which have long been the subject of discussion with scientific observers, without any definite conclusion being arrived at as to their origin. Appearing in all countries of the world, they have attracted much attention and speculation, but no theory yet started to account for them has met general acceptance. Some have ascribed them to whirlwinds, others to electrical origin, and others, again, to a combination of both these causes. They are usually seen at sea in windy and cloudy weather, but occasionally appear in inland districts. In the latter case, however, there is generally water in the locality in the form of lakes and rivers.

Waterspouts at sea are usually formed in the following manner:—A dense cloud is seen to project from its centre a body of vapor, in form something like a sugar-loaf, with the apex pointing downward. This cone is agitated by the wind until it sometimes assumes a spiral form, and it gradually dips more and more toward the sea. As it approaches the water, a similar cone is seen to form upon the surface of the latter, with the point directed upwards, and both the clouds above and the waters below are evidently violently agitated by the influence at work to produce the phenomenon. Suddenly the descending and the ascending cones of water or vapor meet in mid-air, and form one united pillar, which traverses the sea with great velocity. The junction of the two cones is generally accompanied by an electrical flash.

After continuing in this form a short time, the waterspout bursts, in some cases with terrific violence, and to the destruction of anything in the vicinity. Many a ship has been overwhelmed in this manner, and sunk in a moment, with all on board. In 1855, five vessels were thus sunk by a waterspout in the harbor of Tunis.

The number of pirates who infested the Spanish Main in the early part of last century was so large that it can hardly appear wonderful that two women should be found among them, of the same lawless and daring character. Yet the story of the two female pirates—Mary Read, and Anne Bonny, is sufficiently remarkable to claim a place in our pages, and especially as we are able to give portraits of them, copied from an engraving published at the time they lived.

Mary Read was born in England. Her mother, who was married to a sailor, gave birth to a son soon after her husband had departed on a voyage, from which he never returned. When the child was about a year old, his mother left her husband's relations, and went to reside for a time with her own friends. The boy soon afterwards died, but his mother finding herself in need of assistance, took a little girl, the heroine of our story, dressed her up in boy's clothes, and passed her off on her husband's mother as her son. The deception was successful, and the widow was assisted with a weekly allowance, to ensure the continuance of which it was necessary that the girl, whose name was Mary, should pass for a boy so long as the old woman lived.



THE NOTORIOUS FEMALE PIRATES. (FROM AN OLD PRINT.)

Mary was thirteen years of age when the old woman died, and being accustomed to her attire, she was not disposed to change it for the apparel proper to her sex. She first took a situation as foot-boy to wait on a French lady, then entered herself on board a man-of-war; after quitting which, she went to Flanders and carried arms in a regiment of foot as a cadet. Failing to get a commission, she changed to the cavalry, and displayed such courage as to win the esteem of her officers. Her promising career, however, was now cut short by a circumstance which has often changed the fate of men and kingdoms —she fell in love with her comrade, and having made him acquainted with the secret of her life, they pledged troth, and when the campaign was over, were publicly married. Her husband, however, lived only a short time, and on his death, finding herself penniless, she resolved to resume her old manner of life; so putting on man's apparel, she went to Holland and joined a regiment of foot. But she was impatient of promotion, and finding herself one day near the coast, she seized the opportunity of embarking in a ship bound for the West Indies. It happened that this ship was taken by English pirates, who kept Mary amongst them, but soon afterwards took advantage of a Royal proclamation to surrender themselves, and live quietly ashore. This they did so long as money was plentiful; but after awhile, hearing that Captain Woods Rogers, governor of the island of Providence, was fitting out privateers to cruise against the Spaniards, Mary, with several of her comrades, embarked for that island, resolved to make a fortune one way or other.

We now come to the most extraordinary part of Mary's story. Some of the privateer crews, who had been pardoned for piracy, rose against their commanders almost as soon as they had sailed from port, and took to their old trade. In this number was Mary Read, though she afterwards declared that she had always abhorred the life of a pirate, and had resolved to quit it whenever the opportunity should offer. If she really felt this repugnance, it was not for want of courage, as no man in the crew with which she sailed was ever more ready to seize the boarding-pike, or undertake any hazardous adventure.

Anne Bonny was born in the County Cork, where her father was an attorney. He deserted his home, and emigrated to Carolina, taking Anne with him. Here she incurred his displeasure by marrying against his will; and being turned out of doors, found her way to the island of Providence, where she made the acquaintance of a pirate captain named Rackam. On board his ship she fell in with Mary Read, who soon found it necessary to reveal to her the secret of her life. It was natural, after this, that the two women should be often together, and this intimacy excited the jealousy of Captain Rackam, who was so violent that he would have killed Mary if her secret had not been discovered to him also. Then they continued their cruise in harmony, and captured a great number of ships belonging to Jamaica, and other parts of the West Indies, bound to and from England.

Between this period and the capture of the pirate ship, an incident occurred which shows in a striking manner the courage and devotion of which Mary Read was capable. Among the captives taken by the pirate captain was a gentleman of such attractive manners that Mary could not help falling in love with him. It happened that he had a quarrel with one of the crew, when the ship was lying at anchor, and a time was appointed for the two men to go ashore and fight it out. Mary would not on any account have seen the man she loved shrink from danger, yet she could hardly doubt that his chance against her shipmate would be very slight. She accordingly made an occasion for quarreling with the pirate, some two hours before the time appointed for his duel, and fighting him with sword and pistol left him dead.

When the pirate ship was attacked by one of His Majesty's ships, and came to close quarters, only one besides Mary Read and Anne Bonny kept the deck. So gallant was Mary, that she called down to Rackam and his crew, when they fled to the hold, to come up and fight like men; and finding no response, she fired down amongst them, killing one and wounding others. On being asked by one of Rackam's prisoners what pleasure she could have in being concerned in such enterprises, when her life was continually in danger by fire or sword, and not only so, but she must be sure of dying an ignominious death if she should be taken alive, she answered that as to hanging, she thought it no great hardship; for were it not for that, every cowardly fellow would turn pirate, and so infest the seas that men of courage must starve. Anne Bonny also showed her courage to the last. The pirate captain having been admitted to see her, by special favor, on the day he was to be executed, she told him contemptuously that "if he had fought like a man he need not have been hanged like a dog."

About their ultimate fate there is great uncertainty. They were both condemned to be hung, but Mary Read died in prison, and Anne Bonny, having been respited from time to time, also escaped execution; but what punishment she received, and what became of her afterwards, is not on record. In taking leave of them, one can but wonder and lament that qualities so admirable in all, but more particularly in a woman, as courage and endurance, should be capable of the perversion which this story illustrates, among the many wonderful things pertaining to the ocean and the life of its navigators.

CHAPTER XVI.

SUBTERRANEAN WONDERS.

The Inside World—The Earth a Mass of Fluid Crusted Over—Marvelous Caves—Bone Relics—The Famous Mammoth Cave—Mysterious Caverns—The Splendid Star-Chamber—A Cave with Human Bones—The Celebrated Luray—A Strange Bridal Chamber—Various Compartments—Astounding Limestone Formations—Exquisite Flowers in Stone—Fingal's Cave—Wonderful Coal-Beds—A Man Fifty Years in a Swedish Mine—Water Under Ground—Artesian Wells.

THERE is abundant scope for speculative philosophers in the matter of the condition of the interior of the globe, and there are a few facts which will assist any one in the investigation and in the effort of obtaining a correct notion on the subject. The crust of the earth, as far as is known to geologists, consists of the oceans and continents, with their seas and islands. The highest mountain may perhaps be nearly thirty thousand feet, but it is not larger than a grain of sand on a globe three feet across, and the deepest sea would be a very slight depression on the outside. If all the mountains and hills were levelled, and the whole of the land made flat, it would be one thousand feet above the level of the sea. But if all the deep oceans, shallow seas, and lakes were upon a level bottom, the water of the earth would just be fifteen times deeper than the land is high. There would be one thousand feet of dry land, and fifteen thousand feet deep of water.

When a thermometer is taken down very deep mines, and the temperature or heat of the top is noticed first of all, it will be found that as a rule the heat increases one degree for every fifty feet of depth. The deep wells of Grenelle, near Paris, which reach down eighteen hundred feet, are much hotter at the bottom than at the surface. Their heat increases one degree in every sixty feet of depth. If the heat went on increasing at this rate, water would boil at two miles deep, and at thirty-four miles deep iron would melt. In many parts of the world springs come up to the surface whose water is boiling; and it must be remembered that the great agent in all volcanic eruptions is steam, and that the lava thrown out is nothing more than solid rock dissolved at a great depth in the earth by steam pent up and intensely hot. In one eruption, Mount Hecla, in Iceland, threw up lava in such quantities that the whole bulk of it must have been as large as the highest mountain in the United States. There must be, then, great lakes where the steam collects in the crust of the earth, so low down that the heat is enough to melt iron, and they must communicate with the volcanoes.

From this it is considered that as the centre of the earth is reached, the part under the crust cannot be fluid, for the pressure of such thousands of miles of substances one upon the other would make every fluid a solid. Water, if it reached down only three hundred and sixty-two miles, would be like quicksilver, and steel would be compressed into one fourth of its bulk at the centre of the globe. But the heat down there may counteract the effects of pressure, and the kernel of the globe may be a glowing fluid mass. A great philosopher—Mr. Hopkins, of Cambridge—calculated that the solid crust of the earth was eight hundred to one thousand miles thick, and that the rest was a liquid. We live on a shell which seethes and boils within.

WHAT WOULD HAPPEN IF THE EARTH WERE TO CRACK.

It is a reasonable supposition that the crust of the earth is made up of mountains, land, oceans, and flowing waters, sediments of old rocks, and vast lakes containing molten rocks communicating with volcanoes; that it forms but a small portion of the globe; and that all the rest is made up of a mass consisting of a vast number of metals and gas intensely hot and submitted to enormous pressure. This globe, five times heavier than water, and so hot within, is absolutely covered with eternal ice and snow at its poles, and the only proofs most of us have of the heat within are from hot springs and volcanic eruptions.

There must have been a time when the globe, generally speaking, was hotter than it is now, because as it rolls along it gives off some heat to space; and if this be true, at some time, long ages since, the whole world glowed with heat like any of those great meteorites that are often seen far off, and as the smaller shooting stars do that come closer to us. What may be the future destiny of the world is a question pregnant with interest. There are small bodies revolving round the sun that seem once to have formed a large one; and certainly, if ever a great crack were to open out in the crust of the globe, and the ocean should rush down, such an evolution of steam and explosive gases would result as would break up the world into thousands of pieces.

WONDERFUL CAVES.

Caves are mentioned very frequently in Holy Writ, and they were used as habitations, or as burial-places, by the earliest Hebrews. Some caves were made or dug out by those who required them, but most of the caverns and grottoes of the limestone rocks of the Holy Land were made by nature, just as they have been formed in other parts of the world. There are some caves in the island of Cuba formed out of a white marble rock, and they are being gradually filled up in a most remarkable manner. The caves are inland, and are situated at least one thousand feet above the level of the sea, in the midst of dense forests. The snails, of which there are many kinds in Cuba, retire to the caves; and the water which drops from the roof of the caves on to the floor contains much carbonate of lime, a sort of chalk. When the water dries up it leaves the carbonate of lime behind, and it cements the shells together; and as this process goes on year after year, a layer some feet thick soon forms on the floor. Often lumps of the marble fall from the roof and are glued on to the shells. Multitudes of bats resort to the caves, often die there, and their bones are mixed up with the shells by means of the carbonate of lime. Besides this, at certain seasons of the year, the soldier-crabs, which live in the shallow sea-water and on the shore during part of the year, retire to the forests and caves. Every soldier-crab lives in a shell of some dead whelk or top, and when he moves he carries his house on his back. These crabs start from the shore in vast numbers, and they have been traced through eight or ten miles of forest, and up to the caves in the hills. There many die or desert their shells, pulling weaker fellow-soldiers out of larger and more comfortable ones. The floor, with its moist cement, ever ready to envelop everything upon it and to harden, soon begins to rise, and after many years the cave becomes filled with the substances just described, mementoes of ages long gone by.

BONE RELICS STOWED AWAY UNDER GROUND.

What has rendered many caverns celebrated is the extraordinary collection of bones and teeth found in them, all jumbled together and cemented by the same kind of carbonate of lime noticed in the Cuban caves. Now the water which dripped from the roof of the cave must have come through the limestone rock either by means of cracks, or simply by filtering. It is found that rain-water often collects within itself the gas called fixed air, or carbonic acid gas, and when this is the case the water can dissolve small quantities of limestone. When once a crack occurs in a limestone rock opening on the surface, the rain flows down, and gradually eats away the rock; when the opening becomes large enough, a stream flows down and finds its way out, taking away more of the rock, and forming gradually a long system of passages, large caverns and tunnels. It appears that most, if not all, extensive limestone formations contain caverns, some of which are of great extent, and have long been admired for the brilliancy of their stalactites, and the pillar-like forms which they present. The island of Crete contains a great cavern, which has long been the wonder of travelers; and throughout the whole island, there is a world of marvelous caverns.

Kirkdale Cavern, in which such quantities of organic remains were found, is situated in Yorkshire, England. It was first discovered by some workmen in 1821, its mouth being then nearly concealed by stones and earth. On removing these, and exploring the interior, there was found a cavern, two hundred and forty feet in length, fourteen feet high, and from seven to three feet wide. The rock being of limestone, its roof was covered with hanging stalactites, and its floor, in many places, incrusted with stalagmites. The floor of the Kirkdale cavern was covered with a coat of soft mud and loam, about a foot thick, and in this were found the bones of various animals. These were in a high state of preservation; and, though broken, none appeared as though they had been worn by the action of water or sand, which would probably have been the case had they been drifted there in the naked state. The genera of animals to which the bones in this cavern belonged, amounted to twenty-three in number, viz: hyena, tiger, bear, wolf, fox, weasel, ox, elephant, rhinoceros, hippopotamus, horse, deer (three species), hare, rabbit, water-rat, mouse, raven, pigeon, lark, duck and partridge. A great proportion of these animals belonged to species now supposed to be extinct, though the genera of them all are still existing.

A DEN OF RAVENOUS HYENAS.

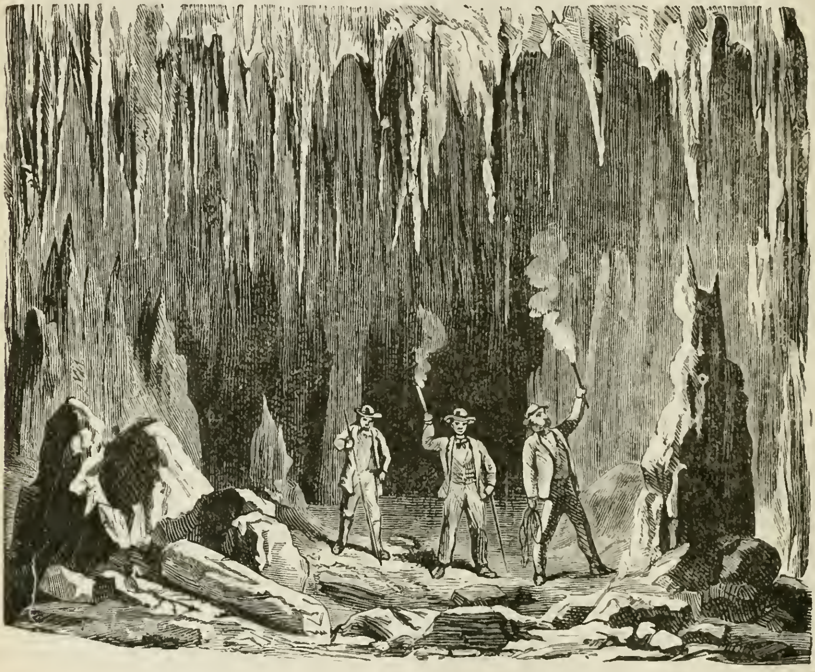
On examination of all the circumstances, Doctor Buckland came to the conclusion that this cave was once a den of hyenas, and that the multitude of bones thus discovered were carried into this place by these animals, and therefore that the hyena, an animal now inhabiting only the hottest climates, once lived in England. These bones were, without exception, broken or gnawed, so that among the vast numbers the cave contained, there could hardly be found all the pieces of a single limb, much less an entire skeleton. The great number of hyenas which had died in this cave, or whose skulls had been carried there, was proved by the great number of canine teeth which it contained.

Doctor Buckland supposes that the contents of these caverns are due to two causes: to the deaths of the prowling animals which inhabited them, and to the bones of other animals, which these brought home for food, and this undoubtedly is the true theory. The elephants and other large animals which do not inhabit caverns, and whose bones are found in them, must obviously have been conveyed there in detached portions; and since the bones of hyenas are found with them, and it is known that these animals carried their prey to such secret places, it is an obvious conclusion that such were the means by which, in a long series of years, such quantities of osseous fragments were accumulated.

The Mammoth Cave is the largest known to exist in the crust of the globe, and is situated in Kentucky. It is entered from the banks of the

Green River, a tributary of the Ohio, and appears itself to have been excavated by some ancient river in some long by-gone age of the world. It consists of a succession of caverns of various dimensions, with intervening passages, and has been penetrated by the curious explorer to a distance of ten miles.

Choosing, and accompanied by, one of the guides, you enter this underground region, and, descending some sixty paces, find yourself in a lofty cavern, or rather gallery, sixty feet wide and half a mile long, which, in consequence of the millions of bats which cluster here, is called, after the great ornithologist, the Hall of Audubon. This gallery is chiefly remarkable for its length, its level floor, and the saltpetre wrought out of it in the beginning of the present century. Arrived at the further end of it, you find you have been conducted by it into a spacious amphitheatre, not inaptly denominated the Rotunda, one hundred feet high and one hundred and seventy-five feet wide, and from which branch off in various directions numerous corridors. Entering by one of these, you are led down a pretty rapid slope into a chamber three hundred feet in circumference, the lofty roof of which is arched like the nave of a cathedral, and supported, as it were, by stalactites resembling cathedral pillars. This cavern bears the name of the Gothic Church, which,



WONDERS OF THE MAMMOTH CAVE, KENTUCKY.

that the resemblance might be complete, Nature has provided with stalls and even a pulpit, whence, it is said, once and again, Christian ministers have preached the gospel. The pillars and pulpit have been formed, in the course of long ages, by water dropping continually from, or rather through the roof, charged with particles of lime and flint, which, as they adhere at the top, depend like icicles, or harden at the floor, rise into columns. Such formations, when suspended from the roof, are called stalactites, and when rising from the floor, stalagmites; and these often result in producing forms strongly similar to those organized by living nature and elaborated by art. In this case so complete is the similarity to a gothic church, that eyes, aided by torch-light and imagination, have discerned here an altar, a font and candalabra, nay, even an organ flanked by draped figures in various attitudes.

A FRIGHTFUL CAVE STREWN WITH MUMMIES.

The avenue called the Gothic—as being no less rich in fantastic shapes, borrowed, as it were, from the gothic model—by which you retire from the church, conducts, through a succession of corridors, into what is called the Chamber of Ghosts. This compartment of the cave is so named because of the immense number of mummies found in it when it was first explored; the only relics it is thought, of a tribe of Indians long since vanished from the earth.

Quitting the Chamber of the Ghosts, your way becomes narrow, tortuous and often steep. First, you descend by a series of ladders, then you cross a chasm by a wooden bridge of the most frail, rickety structure, and are soon involved in the coils of a labyrinth winding and again winding upon itself. At length the passage grows straighter indeed, but the roof lower and lower, until not even stooping will suffice, and you must go down and creep along on all fours. This passage, called the Valley of Humility, terminates in a sort of balcony, to which has been given the name of the Devil's Chair. This chair is a recess cut out in the side of a perpendicular rock, and provided with a window, from which you look down into an abyss deemed by witty people not unworthy of the name they have given it, the Bottomless Pit. The wall in which the balcony, or chair, has been formed is one of the sides of this pit, and is doubtless the brow of the precipice over which once dashed the waters of some extinct Niagara. The abyss yawns gloomy and vacant in the lamp-light both above and below, only darkness visible all round. Bits of paper twisted and dipped in oil, are kindled by the guides, and thrown in, but they keep falling as long as they continue burning, and seem no nearer the bottom when they go out than when they were lighted.

From the verge of this horrid gulf your guides next conduct you, by a succession of ups and downs, to what they call the Mammoth Dome. This is a cavern of immense extent, with a cupola, or dome-like roof, nearly four hundred feet in height, and the vault of which is lost in so dense a darkness as to be invisible even under the light of multiplied torches. A stone of even moderate size, detached from this roof, would, you are told, quickly despatch you, if you happened to be below it, an announcement under which you feel no inclination to tarry longer, and you willingly follow your guide as he precedes you by a path which rises winding to the summit of this dome. Arrived at its lower margin, you look up, and lo, you behold a vault, dark as night, studded all over with star-like fire. This, your guide tells you, is the Star-chamber, while you, as you gaze up, can hardly persuade yourself you are not standing under the firmament of night itself. Being incrusted all over with stalactites of black gypsum, this dome, when illuminated by the lamps of the guides, sparkles like the midnight sky.

A ROLLING RIVER IN THE AWFUL DEPTHS.

Passing from the Star-chamber, you skirt the shores of a lake some fifty feet long and thirty feet broad, which you are gravely told is the Dead Sea; and, by-and-by, you stand arrested on the banks of a river you are assured is the Styx, which, especially when you descry the boat at its margin, reminding you of Charon, you feel half disposed to believe it is. It rolls on, at a depth of three hundred feet below the earth's surface above, in a volume of water forty feet deep, and about five hundred feet onwards dives suddenly out of sight, veiled in its going, as in its coming, like the mystery of life itself. After sailing on this nether river, in which, by the way, you are told anglers have caught two kinds of fishes, one with eyes but without vision, and another with no eyes at all, only marks, you disembark at length at the further end on a bank of fine sand, where you can clearly perceive traces of higher water-levels. Onwards a little further you alight upon a small sulphur-spring, and then by the Cleveland Avenue, whose walls seem wrought all over with a delicate fretwork of flowers, you are at length ushered into what, from the snowy whiteness of its walls, obtains distinction among entities as the Snow Ball-room. From this, by paths now wide, now narrow, now smooth and level, now steep and rugged, you pursue your way, and arrive at length at a range of rocks lying athwart your course, which you see must have fallen detached from the vault above; and as you ascend and descend, you are given to understand are nothing less than the Rocky Mountains. These you cross, not merely for the sake of crossing, but to see the far-famed Fairy Grotto which lies beyond. This grotto, when you enter and inspect it, you find a fairy-realm of pillars and arches which, as the sonorous drippings all round testify, are still unfinished, and not to be seen, therefore, or criticised by fools or children, who, according to a Scotch proverb, should never see things half done.

At the further extremity of this room, as it is called, a group of stalactites may be seen, which, in their curvings and inclinations, are an exquisite imitation, as in alabaster, of an Oriental palm-tree, from the top of which the jet is still in play, under whose droppings and runnings this glittering arabesque is being formed; and this, as you behold it with still fresh wonder, your guide, to your sorrow or not, announces as the close of the entertainment. Thus far, it seems, you have penetrated to a depth of above nine miles; and your journey hither and back, you need not be astonished should it occupy ten hours;—ten hours which, whether marked with white chalk or black on the tablet of memory, are not soon to be forgotten, and likely to form a period to or from which all other events in your history may date themselves.

The account of the terrible experience of an excursion party gives some idea of the vast recesses of this underground world. During the evening, while the party were traveling through the winding passages beyond Echo river, nine of them, who were in the rear, became separated from the main body. The only guide was at the head of the line, and the absence of the rear guard was not noticed for some time. The unfortunates were lost for eight hours in the intricate underground mazes of the mighty cavern. From one till nine o'clock at night they wandered about aimlessly but constantly getting further away from the main track. To add to the terror of the situation, their lights went out, leaving them to wander on in the darkness and dangers of the cavern. The wanderers finally adopted the plan of leaving small articles of clothing in their path as they walked along, and by these means they were finally found by the party of friends who were sent in search of them sitting on the banks of Echo river, to which they had finally arrived. The ladies in the party suffered greatly from nervous excitement, and the excursionists were completely exhausted by the time they got back to the hotel. It was such an experience as they would not wish to repeat in this underground world, although so marvelous.

THE WONDERFUL LURAY AND ITS CAVERNS.

Hidden in the woods near the top of one of the Appalachian hills, about a mile east of Luray, West Virginia, an old cave has always been known to exist. It was not until 1878 that it was completely explored, and now it is one of the wonders of the world, and thousands of people visit it every season. From the narrative of a visitor, a description is given of its marvelous caverns, grottoes, and formations.

The guide opened an inner door and invited us to follow him down a staircase of masonry, and, before we supposed our day's adventures had begun, we found ourselves in the large antechamber of the caverns. This unpremeditated, unintentional entrance is as though you had been dropped into the midst of it, or had waked from a sleep there, and is most effectual in putting the stranger in sympathy with the spirit of the place. The darkness was only faintly illuminated by our few candles, and I was about to remonstrate, when the click and flash of an electric arc, flooded the whole place with light. Our few candles were intended merely for peering into dark corners and helping our footsteps—the general illumination is accomplished by dozens of electric lamps hung in all parts of the wide-winding vaults and passages. Thus every important part of the cave is illuminated.

This first chamber is about as big as an ordinary barn, and from it we proceed upon a causeway of cement for a short distance past the Vegetable Garden, the Bear Scratches, the Theatre, the Gallery; over Muddy Lake on a planking bridge, which is itself spanned by a stone arch; through the Fish Market and across the Elfin Ramble—a plateau in which the roof is generally within reach of the hand; and so come to Pluto's Chasm, which is quite as dismal as its name indicates.

HOW THE CAVERNOUS WONDERS ARE FORMED.

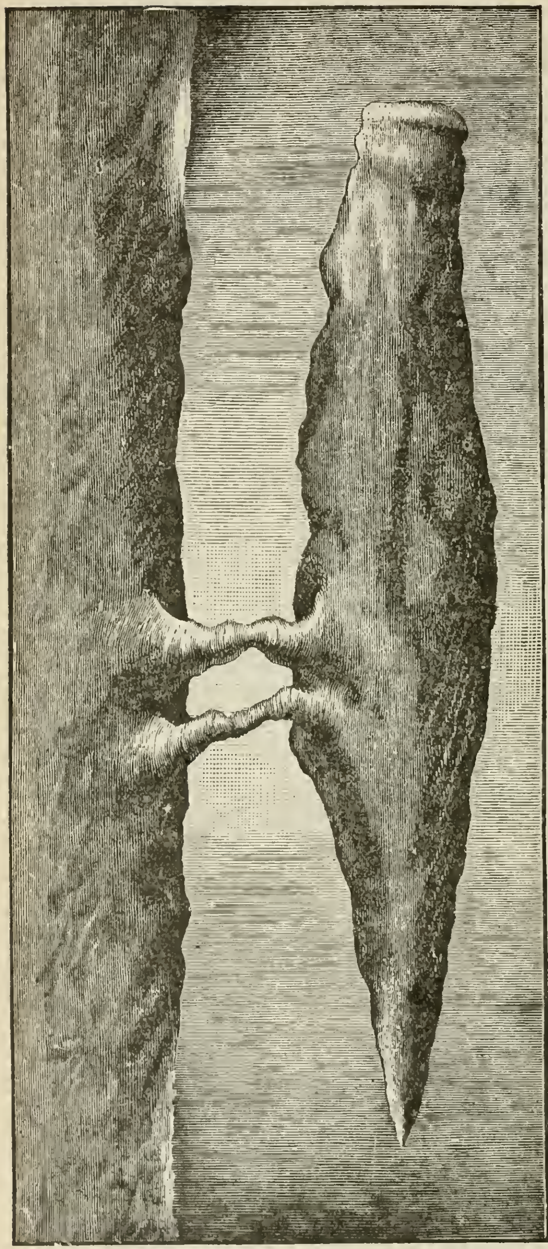
Great caves can only occur in a limestone region, since they result from the chemical fact that carbonates of lime and magnesia are soluble in water containing carbonic acid. This acid abounds in atmospheric air, and is one of the products of the decomposition of animal and vegetable waters, so that rain-water which has percolated through the soil has usually been enriched with it from both sources. Let this chemically charged water find its way into some crevice, and it only requires time and abundance of water to dissolve and hollow out Pluto's and all the other chasms, halls, galleries and avenues; and when once this work has well begun, other natural agencies contribute their aid to enlarge the area and adorn its interior.

From the chasm, where there is a Bridge of Sighs, a Balcony, a Spectre, and various other names and habitations, we re-cross the Elfin Ramble, pass successively Titania's Veil, Diana's Bath, and come to a very satisfactory Saracen Tent. Then we ascend stairways, pass the Empress Column, and proceed under the Fallen Column to the spacious nave of the Cathedral. We pause to note its lofty groined roof and Gothic pillars—surely, in some like scene to this, the first architect of that style met his inspiration!—its large, Michael-Angelesque Angel's Wing, and its Organ. Then we sit down and turn to the prostrate stalactite. It is as big as a steamboat boiler, and bears an enormous pagoda of stalagmitic rock which has grown there since it fell. It thus forms a good text for a conversation as to the age and geology of the cave, concerning which there may be a great variety of opinion.

A GROTESQUE BRIDAL CHAMBER.

Leaving the Cathedral, a narrow, jagged passage, we get an outlook down into a sort of devil's pantheon, full of grotesque shapes and colossal caricatures of things animate and inanimate, casting odd and suggestive shadows in whose gloom fancy may work marvels of unworldly effect, and then are led by a stairway to a well-curtained room called the Bridal Chamber. The back door of the Bridal Chamber admits to Giant's Hall, just beyond which is the Ball-room—both large and lofty apartments, constituting a separate portion of the cave, parallel with the length of Pluto's Chasm. In the Ball-room we have worked back opposite the entrance, having followed a course roughly outlined by the letter U.

I have thus run hastily over the greater part of the ground open to the public, in order to give an idea of its extent and nomenclature. To describe each figure and room separately is impossible. But I can give some general notion of the character of the ornamental formation of crystalline rock which renders this cave without a peer in the world, perhaps, for the startling beauty and astonishing variety of its interior. Chief of all the varieties of stalactite, and the one that in lavish profusion is to be seen everywhere in these caverns, is that which, by growing on the edges only, produces not a round, icicle form, but a wide and thin laminated or sheet form, which is best described by its semblance to heavy cloth hanging in pointed folds and wrinkles, as a table-cloth arranges itself about a corner. Where ledges and table-like surfaces—of which there are many instances in the cave—are most abundant, there the "drapery" is sure to form. In the Market it crowds the terraced walls in short, thick, whitish fringes, like so many fishes hung up by the gills. The Saracen Tent is formed by these great, flat, sharply tipped and gently curving plates, rich brown in color, depending from a square canopy so that they reach the floor, save on one side, where you may enter as through conveniently parted canvas. The Bridal Chamber is curtained from curious gaze by their massive and carelessly graceful folds; the walls of Pluto's Chasm are hung with them as in a mighty wardrobe; Diana's Bath is concealed under their protecting shelter; Titania's Veil is only a more delicate texture of the same; Cinderella Leaving the Ball becomes lost in their folds as she glides, lace-white, to her disrobing; and a Sleeping Beauty has wrapped these abundant blankets about her motionless form; while the Ball-room carries you back to the days of the Round Table, for the



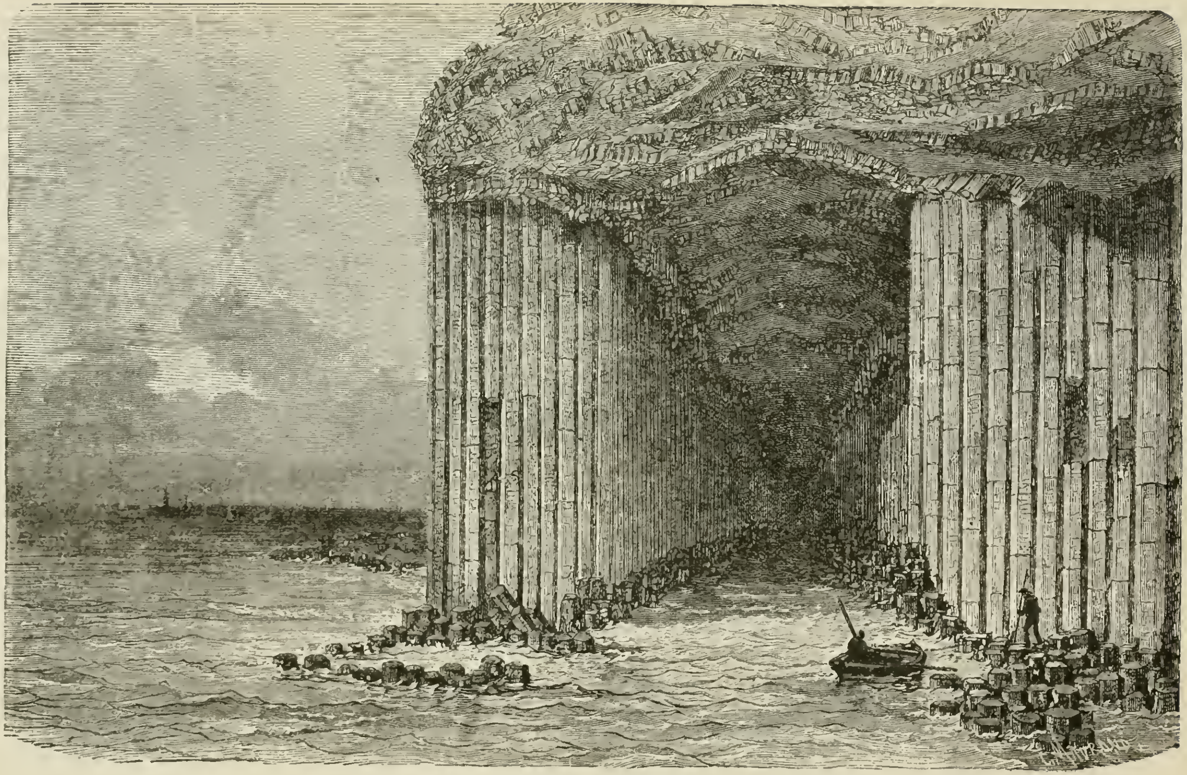
THE WONDERFUL CONICAL SHOT, LURAY.

spacious walls are hung as with tapestries. There is also wealth of color. The range is small, to be sure, but the variation of tint shade is infinite and never out of tune. Where the growth is steady and rapid, the rock is crystal white as at the various Frozen Cascades, the Geyser and many instances of isolated stalactites. But when the steady growth ceases, the carbonic moisture of the air eats away the glistening particles of lime, and leaves behind a discolored residuum of clay-dust and iron oxides. Thus it happens that, from the pearly surface of the new work, there runs a gentle gradation through every stage of yellowish and whitish brown to the dun of the long abandoned and dirty stalagmite, the leaden gray of the native limestone, or the inky shadow that lurks behind. It is thus that the draped and folded tapestries in the Ballroom are variegated and resplendent in a thousand hues. Moreover, various tints are often combined in the same object, particularly in the way of stripes more or less horizontal, due to the varying amount of iron, silica, or other foreign matter which the limewater contained from time to time. The best example of this, and, indeed, of the "drapery formation" generally, is to be found in the Wet Blanket, a very singular formation and much admired.

In more than the general effect the ornamental incrustations of this cave mimic the vegetable growths outside. Many of the stalactites are embroidered with small excrescences and complicated clusters of protruding and twisted points and flakes, much like leaves, buds, and twigs. To these have been given the scientific name of helictites, and the grottoes of Stebbins' Avenue exhibit them to the best advantage. Then there are the botryoids—round and oblong tubers covered with twigs and tubercles, such as that cauliflower-like group which gives the name to the Vegetable Garden; these grow where there is a continual spattering going on. That rigid stone should lend itself to so many delicate, graceful, airy shapes and attitudes, rivaling the flexible flower of the organic world, fills the mind with astonishment and bewilders the eye. And when you have struck the thin and pendent curtains, or the "pipes" of the Organ in the Cathedral, and have found that each has a rich, deep, musical reasonance of varying pitch, then your admiration is complete.

The cave has not yet many human relics; but we must not forget to follow down a long stairway into a deep and narrow gulch, where the dampness and gloom is little relieved by anything to please the eye. At the foot of the staircase the guide drops his lantern close to a trench-like depression, through which a filmy brooklet trickles noiselessly. No need of interrogation—there is no mistaking that slender, slightly curved, brown object, lying there half out, half embedded in the rock, with its rounded and bi-lobed head, nor its grooved and broken companions. They are not fallen, small stalactites; they are human bones. Fit for the mausoleum of emperors, what a vast vault to become the sarcophagus of one poor frame!

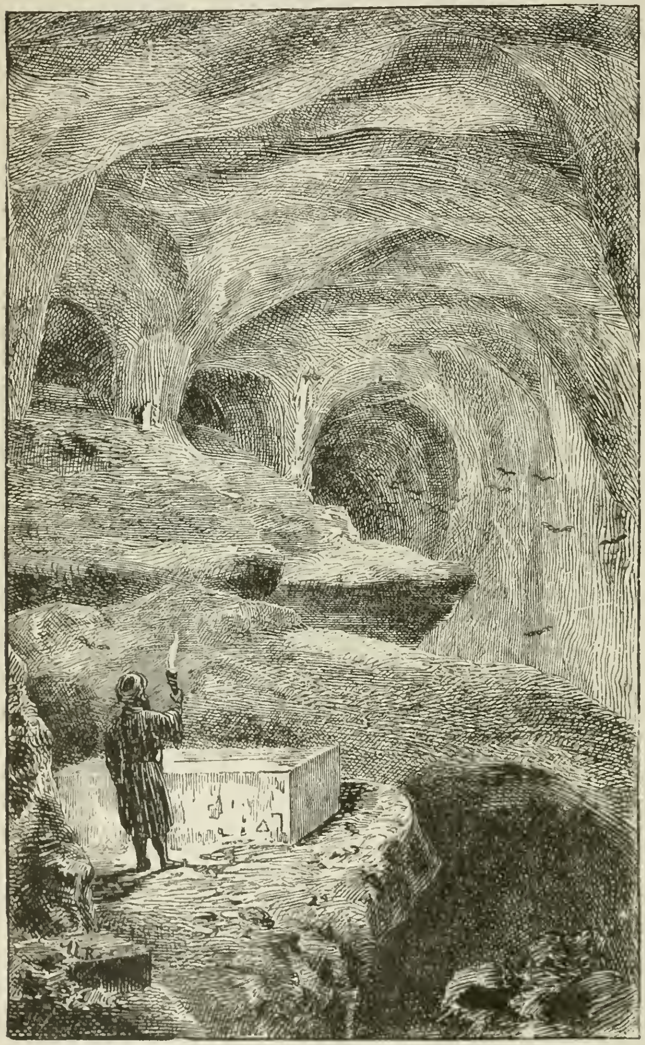
Not alone are the Mammoth and Luray caves objects of world-wide curiosity and amazement. About eight miles distant from the western coast of Mull, and belonging to the Hebrides group, is the small and uninhabited island of Staffa. That it owes its existence to volcanic agency is evident from its composition, which is almost entirely lava and basalt, the columns of the latter substance being the principal formation of the island, and from which indeed it derives its name, Staffa being the Norse term for staves or columns. Numerous caverns are to be found in it, but the most celebrated of all, and to which the island owes its fame, is Fingal's Cave, or as it is sometimes called in Gaelic, Uamh an Binn—the Cave of Music, from a supposed hole in the rock,



THE WORLD-RENOWNED FINGAL'S CAVE.

through which the water flows in and out with a harmonious sound. It lies on the southern side of the island, and it extends inwards about two hundred and thirty feet. Just before the entrance on the right or eastern side especially, the columns are broken and irregular, as if the waves had worn away the shafts and left the bases only; but the entrance itself is through an archway fifty feet wide, and about seventy feet high, surmounted by an architrave of another thirty feet, and which is supported on each side for the whole length of the cave by basaltic pillars of a greenish-black hue, wonderfully jointed, and of great symmetry and regularity. The pillars vary very much in the number of their sides, though the greater part of them have five or six. The roof is almost unbroken in its surface, and is composed here and there of smooth rock, and of the cornices, as it were, of columns broken away—sometimes singly, sometimes in clusters or bunches, from which hang stalactites, white, crimson and yellow. A yellowish-white substance resembling lime has gradually oozed out of the joints of the pillars, filling up the spaces between and defining sharply their angles, the whole forming a species of mosaic work. The pillars on the west side are about thirty-six feet high, rising up straight from the water—while those of the east are, by the raising of their bases eighteen feet, reduced to half the height, the elevation of the roof being the same on both sides. On the eastern side is a ledge—it can hardly be called a gallery—by means of which it is possible to reach the extremity of the cave, which is there twenty feet wide. Though the floor is the sea, and the depth of water at the mouth is eighteen feet, and at the other end nine feet, it is seldom prudent and often impossible to enter. The entrance being so wide, the tide makes its way in in an almost unbroken swell. Standing, however, on the ledge of rock already mentioned, it is a sight exquisitely beautiful to watch when the sun is shining, the light green waves rolling in with a loud boom, made louder by the echoes, scattering the spray to the roof, and washing the half-broken pillars on both sides, when they reach the wall of rock that bars their further progress, and contrasting their color with the dark red or violet rocks that form their bed, and the black columns of the walls varied here and there by the stains of lichens into bright green and red, orange and yellow.

One of the most note-worthy of all subterranean wonders is the sacred cave at Jerusalem. Palestine is a country remarkable for its limestone formations, and, as a consequence, hollow excavations abound almost everywhere. In ancient times these were frequently used as tombs, and names were given to them as we now give names to cemeteries. At Jerusalem may be seen a rock which tradition has always associated with the last scenes in the life of Christ. Under this rock there is a large cave, which may have been used as a tomb in earlier times, and which is regarded with a peculiar veneration on account of the history connected with it. This remarkable rock and its underground excavation can not be far distant from the most sacred spot on the face of the earth. Over the mass of rock stands a tomb-like building, erected in some remote age of the past.



CAVE UNDER THE SACRED ROCK AT JERUSALEM.

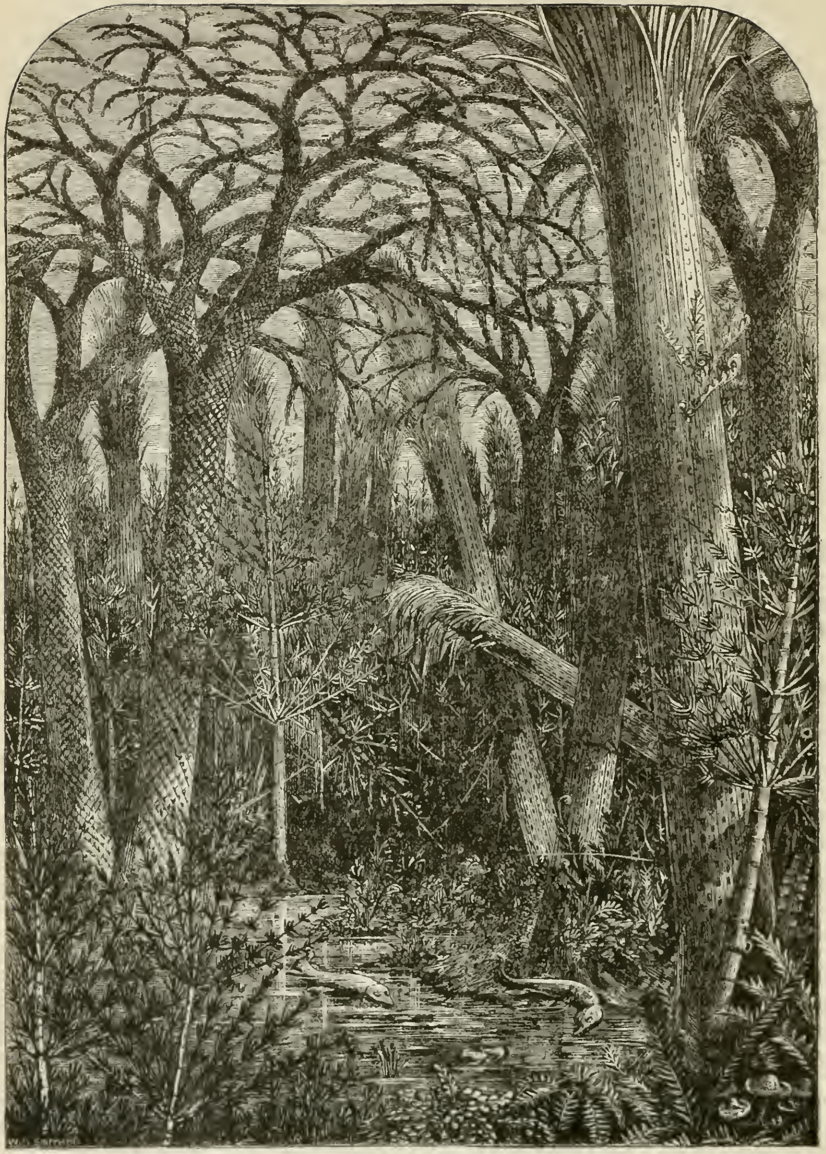
That the hard, stony substance, coal, should have anything in common with wood, except that they both easily burn, seems at first sight very improbable. It is nevertheless true that they differ very little except in appearance; that their properties are nearly the same; and that, indeed, coal was originally formed of wood and other vegetable matter. Wood, peat, brown coal, jet and true coal, when subjected to examination by the chemist, by means of the retort, yield similar products, and are found to differ chiefly in the amount of oxygen which has been given off from the older specimens, and in the smaller bulk into which they have been compressed.

The substance of the coal, although entirely composed of vegetable matter, seldom contains fragments that can be recognized. These abound in the beds above and below the coal itself. The coal always rests on a bed of fine mud changed into stone, and called shale. This is generally much lighter in color than the other shales of the series, and it abounds in a fossil named Stigmaria, from the number of dots or pits all over the surface. This very common fossil was long believed to have been a water-plant, which, when it died, sank down into the mud, and was there buried and preserved. It is now know to be the roots of the great trees whose remains have chiefly formed the coal which rests on the shale, in which these roots are still embedded. They were large fleshy roots, and gave off numerous long cellular rootlets from the pits, with which they are completely covered. The soft structure of the rootlets and their great number, would enable the trees to withdraw a large amount of moisture from the soil in which they grew.

FORESTS TURNED TO COAL.

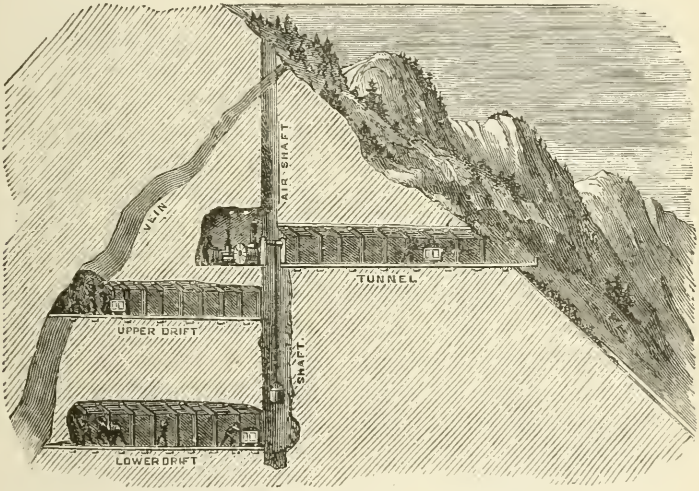
The trees had a very singular aspect. They were straight, simple or branched stems, growing to a height of from fifty to eighty feet, entirely bare throughout the greatest portion of their length, but densely covered on the upper part with very long and slender leaves. The bare portion of the stem was marked with parallel flutings, and the elevated flattened ridges were ornamented with the impressions of the falling leaves, very regular, both in their form and arrangement in each species. The trees had an appearance similar to that of immense leafless cactuses, except that, instead of spines or hairs, the fossil bore true leaves. When, from a change in the level of the surface of the land or other cause, the coal was submerged, and gradually covered with mud or sand, these trees stood erect and were surrounded by the mud or sand. They withstood decomposition until several feet of the deposit was formed. These short trunks in the roof shale of a coal-mine are a source of serious danger to the miner, for when the coal is removed from below, the bed containing them dries to some extent, and the trunks, sometimes two yards in diameter and several feet high, easily separate from the rock because of the layer of coal which surrounds them, and often fall on the workmen.

A human body has been known to undergo a petrifying process similar to that which changes vegetable growths into coal. In the Swedish mines of Fahlun, while making a cross excavation between the shafts, some workmen discovered a corpse, so saturated with the vitriol, which is found in iron-mines, as to become, when brought into the air, as hard



THE WONDERFUL COAL-PRODUCING FOREST.

as stone, though perfectly soft when first touched. For fifty years had the body lain three hundred feet below the surface of the ground in a pool of vitriol; and no one would have recognized the unaltered features of the unfortunate young man, no one would have remembered the circumstance of his having been lost (traditions of the neighborhood becoming confused, owing to the melancholy frequency of such accidents), had not the heart of a faithful woman identified the once beloved face; for when the inhabitants of the neighborhood, full of eager curiosity, were pressing round to gaze on the recovered corpse, an aged gray-haired female, leaning on crutches, came up weeping, to the body, affirming it to be that of her betrothed husband, and blessing God for the day on which the gates of the grave had opened, to enable her to look on him once more. The bystanders beheld with astonishment the re-union of this singular pair, of whom one had retained his youthful appearance in death, and in the bowels of the earth, while in the other the warm love of youth had remained true and unaltered, amidst the decay of her beauty and the inroads of old age upon her wasted exterior. Underground chemical forces are always at work.



VERTICAL SECTION OF A COAL-MINE.

One set of our coal-mines—or, as it is commonly called, a coal-field—is larger than half of the New England States, being seven hundred and thirty miles long and one hundred and eighty miles broad. The great value of coal arises from its power of producing a great amount of heat from a small bulk in a short space of time. The amount of heat that a pound weight of coal, set on fire in a good draught, will produce, is wonderful, and it can be measured by the warmth it will impart to a kettle of cold water suspended over it. This heat is produced by the burning of the gases of the coal in the air of the atmosphere, and by the capacity for retaining heat which the solid part of the coal possesses. If a piece of coal be placed in the bowl of a pipe, and we then cover it with a lump of clay, and put it in a fire, leaving the end of the pipe outside, some steam comes off, and then a strong-smelling gas, which is the same as is burned in gaseliers. This gas can be collected by letting it bubble up through water into a vial full of water turned upside down. When all the gas has come away, if the bowl of the pipe be examined, what is called coke will be found instead of the piece of coal. Coal consists, therefore, principally of gas and coke, and there is besides a liquid which is produced during the gas-making, called coal-tar. Coke often looks like charred wood, and it is really so, for coal is altered wood and vegetable matter. When the mineral is brought up from the mine it contains impressions of fern-leaves and of trunks of palm-like trees. Some of these impressions are very beautiful, and geologists have studied, described and drawn no less than a thousand kinds of plants which have been noticed in the coal of all parts of the world, some of which are very much like plants now living in tropical climates. Large succulent trees are often found in the coal turned into that mineral, and their roots are still fixed in the clay beneath the layer or seam of coal. Besides leaves and fir-cones, many other vegetable matters are found, and they are frequently so well preserved that the microscope detects the delicate structure which characterizes them at the present day. Many animals and insects are found in the coal, such as huge toad-like reptiles with beautiful teeth, small tree-lizards, water-lizards, great fish with tremendous jaws, tiny water mites, a sort of snail, hundred-legs and many insects of the grasshopper and dragon-fly tribes. But none of these are of the same kind as those now living on the globe. Other subterranean wonders abound.

RIVERS HUNDREDS OF FEET UNDER GROUND.

After rain has fallen it disappears in three ways: some runs off the ground into small streams, brooks, and rivers; some evaporates and mixes with the air in the form of vapor, and the rest sinks into the soil. It is this last method by which rain is got rid of that is of the greatest importance to men, for it has to do with the collection of water in the crust of the earth, which is tapped when wells are sunk.

Ordinary wells are dug out by hand to the depth of from thirty to seventy feet, and the water out of the soil in which they have been made soaks into them. There is no attraction for water on the part of the well; but in the natural course of things, the water derived from the rain on the surface moves downwards and sideways into the earth, and falls into cracks and cavities, such as wells, when they come in the way. Usually such shallow wells as these only supply a moderate quantity of water, and are apt to become dry if there has been no rain for some time. Other wells have been invented to supply a constant flow of pure water almost to an unlimited extent even during long droughts. Water goes on sinking through the earth until it comes to a rock or bed of earth very much denser and harder than those it has got through. The water stops on the top of the hard earth, and although much goes through it during the lapse of time, still there is always a great mass of wet earth on the top. The hard stratum, as it is called, may be hundreds of feet in the earth, and the quantity of water immediately above it depends upon the extent of the stratum, and whether it is quite flat or not. If there is not much of the hard stratum there will not be much water, and if it is flat the water will tend to run off sideways. But very often the stratum is in the form of a basin, and then the water is kept within certain bounds, and if it can be got at, the supply is enormous, because the rain of centuries has collected, and any loss is made up by the gradual passage downwards of the rain which occurs throughout a whole year. The wells are called artesian because they were first attempted to be made at Artois, in France, and some have had to be formed at prodigious depths. At Grenelle, near Paris, a well was sunk to the enormous depth of one thousand six hundred feet, and yet no water came; but at one thousand eight hundred feet a hard stratum was reached, for they pierced quite through the chalk, and got to a hard green sand. Then the water rushed right up to the surface, and overflowed at the rate of half a million gallons a day. Moreover, it was warm.

These wells are dug by a machine called a borer. It is a bar of iron with a scoop at the lower end like a gimlet, and a place for another bar to be screwed in at the upper end. The bar is placed in the earth and turned round by steam power, and after having been twisted round a few times, it is brought up to the surface, and the scoop is cleaned out. When any great depth is reached this is a very troublesome affair, for fifty, sixty, or more rods have to be screwed and unscrewed every time a few inches of earth are removed. The bore made for the well is thus very small, and is lined with pipes for a long distance down. When once water is got, the supply never fails. The French government has sunk artesian wells in the desert of North Africa, and many fertile spots now exist in the midst of that waste. In sinking these wells some very curious things, such as small fish and vegetable matter, were brought up by the rush of water, showing that water circulates underground from place to place.

CHAPTER XVII.

WONDERS OF ANIMAL LIFE.

Wonderful Provision for Animal Wants—Fur, Nails and Feathers—Beautiful Arabian Horses—War Chargers—Equine Intelligence—His Majesty King Leo—The Polar Reindeer—Great Irish Deer—The Musk Ox—The Yak—The Spry Syrian Goat—The Fleet Kangaroo—Wild Animals of the West—"The Ship of the Desert"—The Wild Ass—The Long-Clawed Aye-aye—Sly Reynard—A Four-Footed Fisherman—The Jerboa—A Long-Nosed Animal—White Monkeys—The Odd Mandrill—White Elephants—The Elephant's Sagacity—The Hugh Mammoth—A Gigantic Tortoise—Polar Bears—Grizzly Bear of California—The Seal—An Animal Charmed with Music—The Monstrous Sea-Horse—The Alligator—The Hard-Shelled Armadillo—A Wonderful Dog—Intelligent Cats—An Animal that Dies from its Own Bite—Leeches in Ceylon—Darwin's Crab—Construction of Animals.

NATURE has provided with admirable care and in an infinite number of ways for all the wants of the animal creation. To the animal of a mild and peaceable character, to which fighting and struggling against too redoubtable adversaries is forbidden, she has provided the means of avoiding and escaping from its enemies. Some are marvelously organized for running, as the hare and the gazelle. Others hide themselves in subterranean retreats, which serve them at the same time as barns, in which to preserve their provisions against the winter: such are the rat, the marmot, and others. Others, like the armadillo, present to their adversaries an invulnerable cuirass. Some, erecting their bristles, as the porcupine, present to the enemy a forest of spikes. There is not one animal, however weak it may be, which has not its artifices and means of defence against its most terrible enemies. If it were otherwise, all of the more feeble creatures would have been long since exterminated.

The clothing which grows from the bodies of animals is always suitable in quality and quantity to the climate and season under which they live. In hot climates the coat of quadrupeds is short and thin, but it thickens with increasing latitudes, and yields soft and abundant fleeces. At the poles it is externally shaggy and coarse, internally shorter and fine, as in the skin of the Arctic bear. How defensive is the fur of amphibious animals, the beaver, for example! How abundant and smooth upon birds are feathers, shutting up the heat of their warm blood, and opposing no resistance to the air through which they fly! The birds of very cold regions have plumage almost as bulky as their bodies; and those which live much in the water have additionally both a defence of oil on the surface of the feathers, and the interstices of the ordinary plumage filled with delicate down—a bad conductor, which abounds particularly on the breast, as it, in swimming, first meets and divides the cold wave. Then there are animals with warm blood which live in the water—for example, the whale, seal, and walrus; but neither hair nor feathers oiled would have been a fit clothing for them. They accordingly derive protection from the cold water by the enormous amount of blubber or fat which surrounds their bodies, and acts as a non-conductor.

As a general rule, the hair of the animals falls off about spring or autumn, and is then replaced by new hair; this is what is called the shedding of the coat, which in some species takes place twice in the year. The scales, nails, horns, flakes of whalebone, which certain animals have, may be regarded as so many different forms of tegumentary appendages of the same nature as hair. The general form of the body is determined by the shape of the bony skeleton. The form of the skull varies exceedingly. Some have on the head or on the nose certain horn-like appendages. These appendages are sometimes merely the result of a very close conjunction of the roots of the hair, and are thus appendages to the skin; such is the case with the horn or horns upon the face of the rhinoceros. In other cases the horns are placed on the skull itself, and are appendages to the skeleton, though covered by the skin.

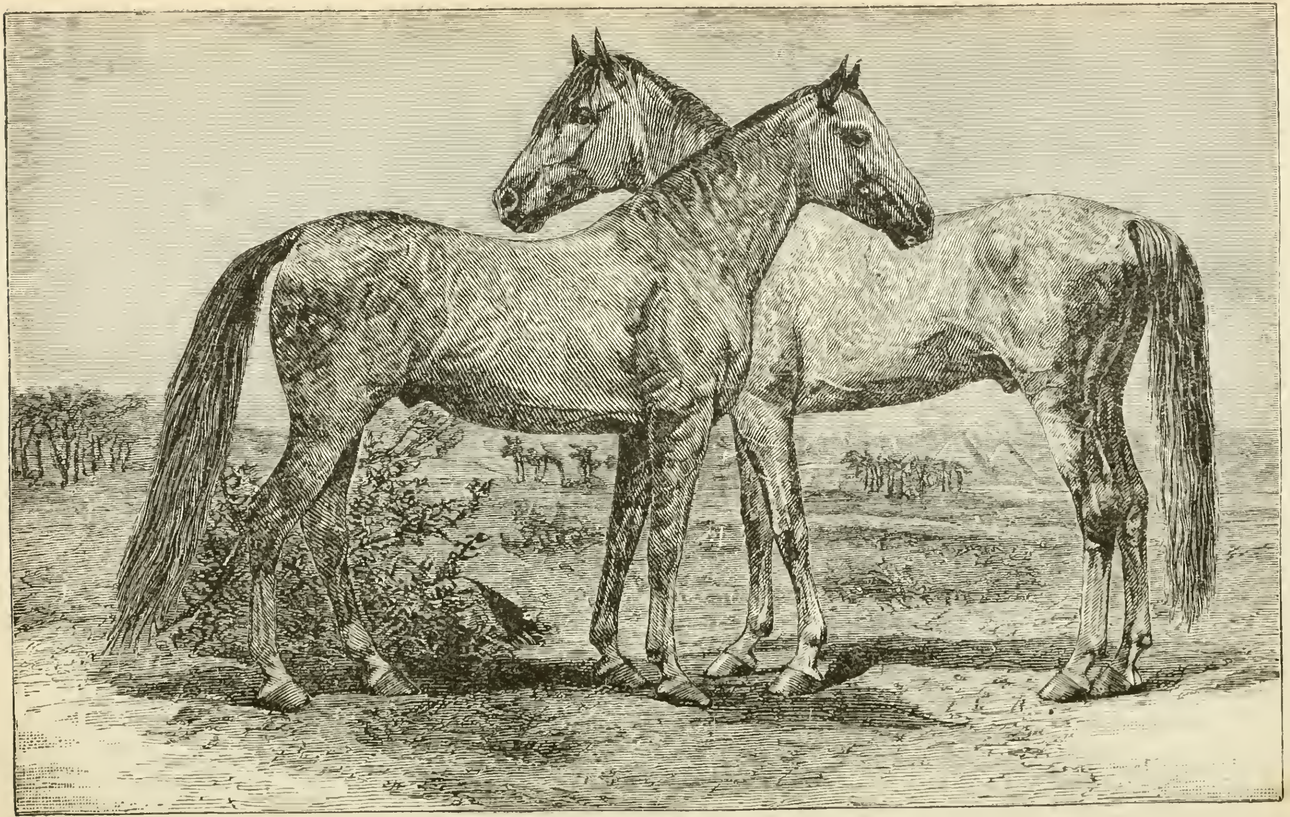
Beginning our description of animals with the horse—none the less a marvel in many respects because he is an object so familiar—we shall find abundant occasion for wonder in the lower forms of animal life. It is only in Arabia where the horse is found bordering on perfection. Here he is remarkable for a small head with pointed ears, peculiarly clean, muscular limbs, a corresponding delicate, slender shape, rather small size, and large animated eyes, expressing that intelligence which, as in the dog, is the consequence of being constantly with the members of his master's family—in fact, he generally shares their meals. He is frequently allowed to frolic through the camp like a dog; and at other times he is hitched at the entrance of the tent. He is exposed to the weather at all times; and, compared to the treatment of his species in America, he is scantily fed. A meal after sunset, consisting of barley, in some parts of the country, and camel's milk in others, or a paste of dates and water, sometimes mixed with dried clover and other herbs, constitute his usual sustenance; but on any extraordinary exertion being required, flesh is frequently given, either raw or boiled.

The Bedowins count five noble breeds of horses, all, as they say, derived originally from the desert region of Arabia. Of these there are many branches; and there are other breeds which are considered secondary. The catalogue of distinct breeds in the desert is almost endless, and the pedigrees of individuals are verified by certificates which are handed down from father to son with infinite care; and not unfrequently they belong to more than one family; for there is often a copartnership in mares, and hence arise the difficulties attending the purchase of one.

While General Grant was on his celebrated tour round the world, the Sultan of Turkey, wishing to make him a present worthy of both the giver and the recipient, presented him with a fine pair of Arabian horses, which were exhibited in this country.

The remote epoch to which we can trace back the horse being employed as a domestic animal renders it very difficult to determine its original country. At the present day, we are generally led to consider the horse as originally a native of Asia, and that it appeared for the first time either on the vast central plateau which occupies so large a space in this quarter of the globe, or on the steppes to the north-east of the Caucasus. As the originally wild horse does not exist in any country, it is quite as impossible to recognize its primeval traces in historic times as to state with any certainty the native country of the first oxen, the first goats, the first pigs, the first sheep, or the first dogs.

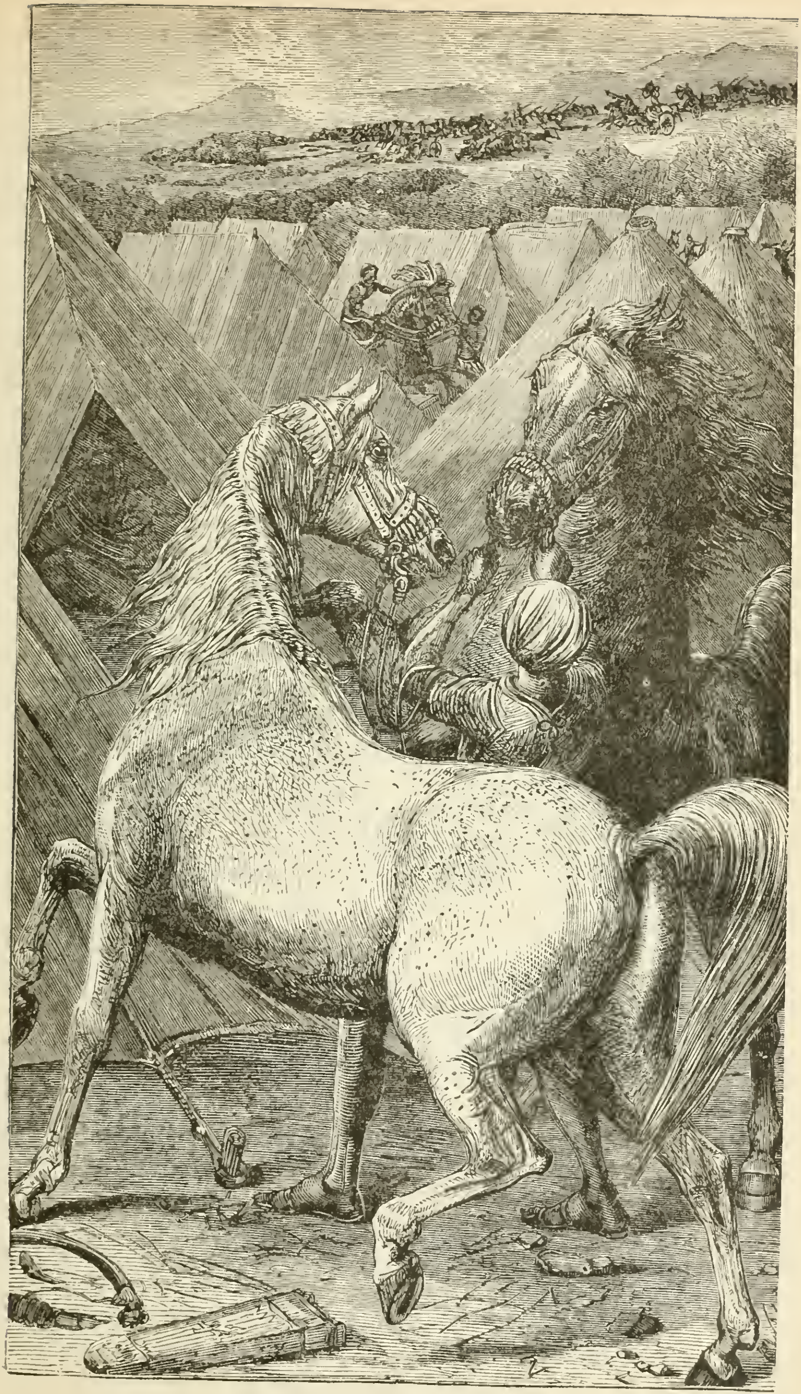
There are, however, droves of horses free and unowned, living on the plains of Asia and the pampas and prairies of this country; but all zoologists agree in considering them as the descendants of certain domestic races, somewhat modified in their shape and habits by having returned to a state of liberty. At the date of the discovery of the New World, it is certain that no animal of the horse genus existed here; at the present day, on the contrary, we find immense hordes of them, which, through their wild and exposed life, have lost many characteristics which were possessed by their progenitors. These horses, called tarpans, mustangs and parameros, according to locality, live most frequently in bands of fifteen to twenty, of which only one is a mature male. In the pampas of Paraguay, however, the droves are sometimes composed of more than ten thousand animals. They are controlled by chiefs, who always lead them in traveling as well as in escaping pursuit, and each drove inhabits a particular district, which it defends against the invasion of strangers, and does not abandon unless obliged by deficiency of pasturage, or by the attacks of some of the larger carnivora. The migration of wild horses crossing the wide plains of the New World, almost shaking the ground under their measured tramp, is a spectacle to delight the traveler. Divided into squadrons composed



WONDERFUL ARABIAN HORSES PRESENTED TO GENERAL GRANT BY THE SULTAN OF TURKEY.

of a stallion and his attendants, the column progresses, preceded by their scouts. If these droves should meet with domestic horses, they invite them by neighings to regain their lost liberty and join their wandering phalanx, a request too frequently accepted. Spaniards and Indians capture wild horses by surrounding and forcing a drove to enter an inclosure, called a coral, where a horseman, armed with a lasso (a long strip of green hide, provided with a noose at one end) or the balleros (two balls connected by a cord) is placed. In Mexico the former implement is used, in lower South America the latter, and the skill and address with which these people entangle and throw the objects of their pursuit are truly surprising. However violent and protracted the struggle, the victim must ultimately succumb, when a leather strap with a slip noose having been placed round its lower jaw, or a villainously cruel Spanish bit in its mouth, an Indian mounts. After making vain efforts to get rid of the man, the horse sets off at full gallop, stimulated moreover by the spur. After being ridden till thoroughly exhausted, and its lungs bursting for want of breath, it submits to be led back to the coral. Henceforth it is tamed, or, more properly, broken-spirited, and although left free with the domesticated horses, does not seek to escape; for having felt the brand of serfdom, it feels unworthy of liberty. Young horses are generally selected for this mode of breaking, as they give less trouble than those that are older, and, from their making a less determined resistance, are not so subject to injuries that mature into blemishes, or frequently cause unsoundness.

When horses are hit in battle, they stop, tremble in every muscle, and groan deeply, while their eyes show wild astonishment. During the battle of Waterloo, some of the horses, as they lay on the ground, having recovered from the first agony of their wounds, fell to eating the grass about them; thus surrounding themselves with a circle of bare ground, the limited extent of which showed their weakness. Others of these interesting animals were observed quietly grazing in the middle of the field, between the two hostile lines, their riders having been shot off their backs; while the balls that flew over their heads, and the tumult behind and before and around them, caused no interruption to the usual instincts of their nature. It was also observed that when a charge of cavalry went past, near to any of the stray horses already mentioned, they would set off, form themselves in the rear of their mounted companions, and though without riders, gallop strenuously along with the rest, not stopping or flinching when the fatal shock with the enemy took place. At the battle of the Kirk, in 1745, Major Macdonald, having unhorsed an English officer, took possession of his horse, which was very beautiful, and immediately mounted it. When the English



SPIRITED WAR HORSES.

cavalry fled, the horse ran away with its captor, notwithstanding all his efforts to restrain him; nor did it stop until it was at the head of the regiment, of which, apparently, its master was the commander. The melancholy and, at the same time, ludicrous figure which Macdonald presented when he thus saw himself the victim of his ambition to possess a fine horse, which ultimately cost him his life upon the scaffold, may be easily conceived.

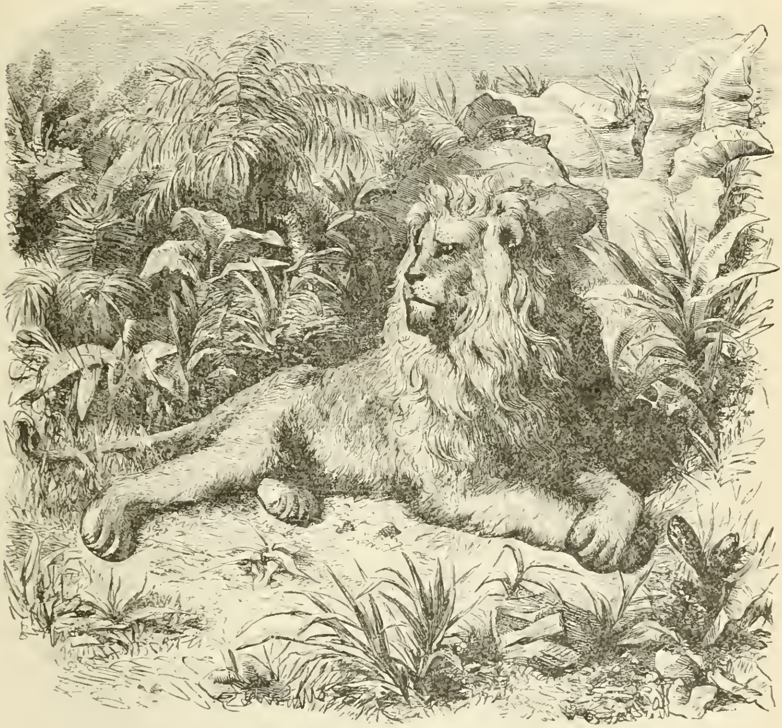
In a well-known work, which is the highest authority, the following examples of equine intelligence are recorded: It is remarked by those who have much to do with blood-horses, that when at liberty, and seeing two or more people standing conversing together, they will approach, and seem, as it were, to wish to listen to the conversation. The farm-horse will not do this, but he is quite obedient to call, and distinguishes his name readily from that of his companions, and will not stir when desired to stand till his own name is pronounced. He distinguishes the various sorts of work he is put to, and will apply his strength and skill in the best way to effect his purpose, whether in the threshing-mill, the cart or the plough. He soon acquires a perfect sense of his work. A plough-horse will walk very steadily towards a directing pole, and halt when his head has reached it. He seems also to have a sense of time. The horse is capable of distinguishing the tones of the voice, whether spoken in anger or otherwise, and can even distinguish between musical notes. A work-horse has been known to leave off eating and listen attentively, with pricked and moving ears and steady eyes, the instant he heard a low note sounded, and would continue to listen so long as it was sustained; and another was similarly affected by a particular high note. The recognition of the sound of the bugle by a trooper, and the excitement occasioned in the hunter when the pack give tongue, are familiar instances of the power of horses to discriminate between different sounds. They never mistake one call for another.

THE KING OF THE FOREST.

As the horse may be said to stand at the head of domestic animals, so the lion among the wild beasts outranks all others, and holds a place by himself. For courage and commanding presence, he is unrivalled.

If the impression made by the first sight of this animal be retained, it must be confessed that the lion is no usurper of the title "King of the Beasts," which has been awarded him from the most ancient times. He carries his head high, and walks with a slowness which may well pass for dignity; his visage is calm and dignified, and announces a full consciousness of his strength. The bushy and magnificent mane which overshadows his head and neck is an addition which confers on his remarkable appearance an air of grandeur which commands awe.

Some adult lions have attained a length of nearly ten feet, from the tip of the muzzle to the root of the tail; but, generally speaking, they do not exceed six to seven feet. With the exception of the mane and a tuft of hair at the end of the tail, the coat is entirely smooth, and of a nearly uniform tawny color. The female is distinguished by the absence of any mane, and by a smaller head; she is generally, in proportion, about one-fourth less than the male. Buffon has drawn a magnificent portrait of the lion, which will ever remain one of the most beautiful passages in French literature. He attributes to it the good qualities of courage, magnanimity, generosity, nobility of character, gratitude for kindness and sensibility. Unfortunately, this elaborate panegyric is fated to give way before observation.



HIS MAJESTY, THE LION.

As a rule, the lion does not hunt during the day; not that his eyes are unfitted for diurnal vision, but indolence and prudence keep him at home till evening. When the first shadows of twilight appear, he enters upon his campaign. If there is a pool in the vicinity of his haunt he places himself in ambush on the edge of it, with the hope of securing a victim among the antelopes, gazelles, giraffes, zebras or buffaloes, which are led thither to slake their thirst. These animals, well aware of this habit of their enemy, will not approach a pond without extreme caution. If one, however, places itself within reach of their terrible foe, its fate is generally sealed. One enormous bound enables the lion to spring on it, and one blow with its paw breaks its back. If the lion misses his aim, he does not endeavor to continue a useless pursuit, well knowing that he cannot compete in speed with the children of the plains. He therefore skulks back into his hiding-place, to lie in ambush until some more fortunate chance presents itself, or complete nightfall comes.

PRODIGIOUS STRENGTH AND AUDACITY.

The lion, however, is not disposed to remain long with an empty stomach. Then it is that he approaches man's habitations, with the hope of surprising the domestic animals. Fences, ten feet in height, form no obstacle to him, for he will bound over such with ease, when, falling into the midst of the herd, he seizes the nearest. The amount of strength which he manifests under circumstances similar to these is really extraordinary. A lion has been known, at the Cape of Good Hope, to carry off a heifer as a cat would a mouse, and, with the burden, leap a wide ditch. It is almost impossible to conceive the muscular force necessary to jump a fence several feet high when carrying a load of several hundredweight.

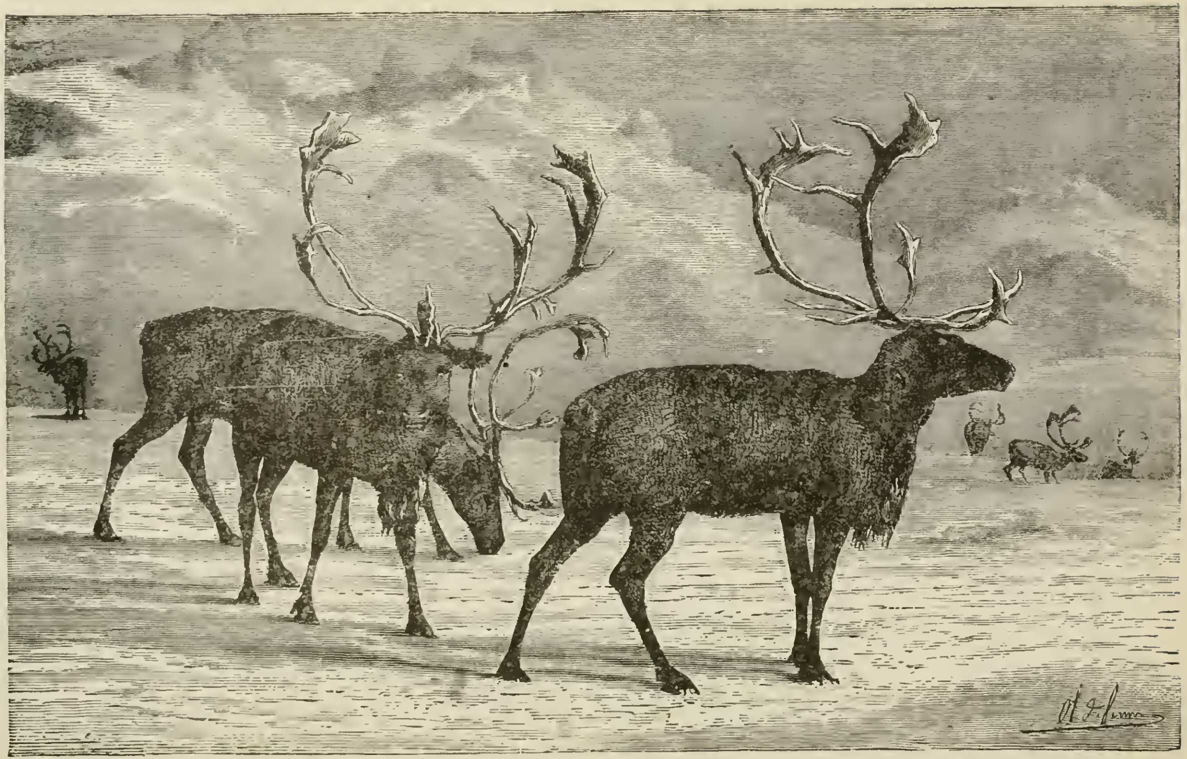
The audacity of the lion increases in proportion to his need. When he has exhausted all means of procuring subsistence, and when he can no longer put off the cravings of hunger, he sets no limit to his aggressions, and will brave every danger rather than perish by famine. In open day he will then proceed to where herds of oxen and sheep are pastured, entirely disregarding shepherds and dogs. At such times he has been known to carry his rashness so far as to attack a drove of buffaloes, an action which is all the bolder, as a single buffalo, unless it is taken by surprise, is well able to defend itself. One feature, which seems peculiar to the nature of South African lions, is, that they will combine to hunt those animals which, singly, they are unable to encounter with certainty of success. Delegorgue relates that in winter twenty or thirty lions have been seen to assemble during the day-time, and drive their game into narrow passes, in which some of their companions were posted. These are, he says, regular hunts, conducted in due order, but without noise; for the smell of the lion is quite sufficient to drive before it the herbivorous animals. The rhinoceros is sometimes destroyed in this way by associations of lions. There is one important fact which has several times been observed. When the lion is hungry or irritated, he flogs his sides with his tail and shakes his mane. If, therefore, a traveler finds himself unexpectedly in the presence of a lion, he may thus know the brute's intentions, and can take precautions accordingly. If the tail does not move, the animal may be passed without fear; not only will he not spring upon you, but throwing a stone at him will suffice to drive him away. Under the reverse circumstances, no time must be lost in seeking a place of refuge, unless you are in a position to commence a contest with your arms, and then the more prompt and determined your action the more successful will be the issue, because the lion seldom attacks any living creature when his appetite is satisfied, and because he is content with one victim at a time.

AN ELEGANT RACE OF ANIMALS.

All the members of the deer family are remarkable for the elegance of their shape, the dignity of their attitudes, the grace and vivacity of their movements, the slenderness of their limbs, and the sustained rapidity of their flight. They have a very short tail; moderately sized and pointed ears; their nostrils are generally situated in a muzzle, and their eye is clear and full of gentleness. In most of the species there is, below the internal angle of the eye, a small depression, called a tear-pit, which is nothing but a sort of gland, secreting a peculiar fluid. This gland is not, however, as might be supposed from the name, the place from which the tears proceed.

The reindeer is about the size of the red deer, but it is heavier built. The legs are finely made, although less slender than those of the stag, and are terminated by firm and strong feet. The latter are covered all over with stiff hair, even on the underneath part, a circumstance which singularly facilitates the animal's tread on ice and frozen snow. Its coat is rough, of a greyish-brown color, and is pendent under the throat; in the winter it becomes woolly, and frequently changes color to white. The reindeer is a native of the icy deserts of the Arctic regions, and the most northerly countries in which man has placed his abode. It is a most valuable animal to the people who dwell about the Arctic circle. Without it existence in these high latitudes would scarcely be possible. We can hardly form a just idea of the services which this animal renders, more especially to the Laplanders, for to them it fills the place of horse, ox and sheep; for, when domesticated, it goes in harness like the first, and drags sledges and carriages even with great rapidity. On even ground it can travel twenty miles an hour; but its ordinary pace is from twelve to sixteen miles in that space of time. There is in the palace of the King of Sweden, a picture representing a reindeer which carried an officer charged with urgent despatches a distance of nine hundred and sixty miles in forty-eight hours. At the end of the journey the poor animal is reported to have died.

The mode of harnessing and driving the reindeer is most simple. A



THE REINDEER OF THE ARCTIC REGIONS.

collar of skin is fastened round its neck, and from this a trace hangs down, which, passing under the belly, is fastened into a hole bored in the front of the sledge. The rein consists of a single cord fastened to the root of the animal's antlers, and the driver drops it on the right or left side of the back, according to the side to which he wishes to direct the animal. The vehicle being very light, traveling may be rapidly performed in this equipage, but not without running some risk of breaking your neck; for, to avoid being upset, one must be very skilful in this sort of locomotion. The Laplander is a perfect master of this art. We have not yet mentioned the most important articles this ruminant of the Arctic regions yields to man. The female produces milk superior to that of the cow, and from it butter and cheese of excellent quality are made. Its flesh, which is nuitritious and sweet, forms a precious alimentary resource in the Polar regions. Its coat furnishes thick and warm clothing, and its skin is converted into strong and supple leather. The long hairs on the neck of this animal are also used for sewing, while out of its tendons string is manufactured. From the old antlers of the reindeer various utensils are made, such as spoons and knife-handles, and when the horns are young, gelatine is extracted from them by submitting them to a severe course of boiling.

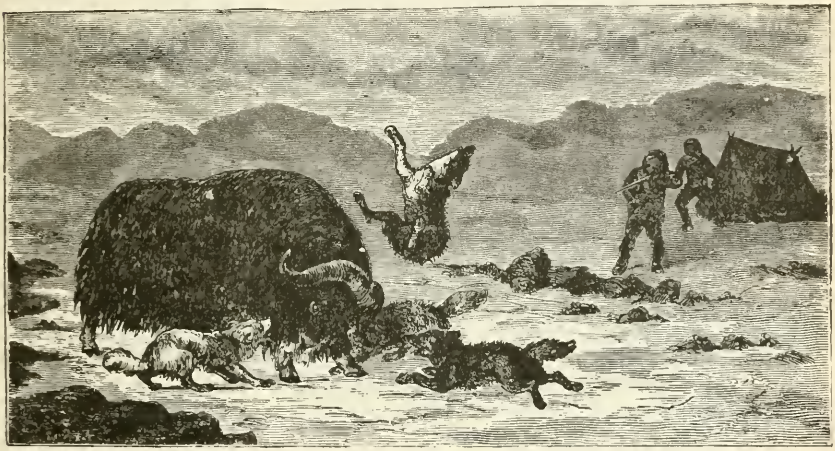
The reindeer is truly an invaluable companion to the people of high latitudes. The poorest Laplander possesses at least several pairs; while the wealthy have immense herds of from four to five hundred, even sometimes of several thousand of these animals. During the day they are taken to graze; and at night they are shut up in sheds, or left out of doors in an inclosure sufficiently high to shelter them from the attacks of wild beasts. These flocks need a great deal of supervision, as the reindeer is somewhat inclined to return to its wild life if granted too much liberty. All the individuals composing these herds are marked with the brand of the proprietor, so that they may be recognized when they stray in the woods, or when the flocks get mixed. The wild reindeer unite in vast herds, which migrate from one climate to another according to the seasons. In winter they come down into the plains or valleys near the sea-coast, and there feed on the lichens which they excavate with their feet from under the snow. In summer they ascend the plateaux to graze on the buds and leaves of mountain shrubs. They are, moreover, induced to select these elevated situations in the warm season to lessen the attacks of the horse and gad-flies, which otherwise would incessantly prey upon them. The latter insects, at the time when these quadrupeds change their coat, deposit their eggs on the surface of the skin; the larvæ, after they are hatched, penetrate under the epidermis, causing acute pain.

In the caves, gravels, and peat-bogs of the British Isles are found not unfrequently the remains of animals which no longer inhabit Western Europe. Some of these animals still exist, as the aurochs, or European bison, in Russian Poland, the reindeer in Lapland, and the musk-ox, now only found existing in extreme northern regions. Others, again, are entirely extinct, as the mammoth and the woolly rhinoceros, both of which were formerly extremely common. To the last category belongs the animal of fine construction which has generally received the name of the Irish elk, owing to the great abundance of specimens found in Ireland. The creature has generally been called an elk, probably because the largest member of the deer family still existing bears that name, but it does not resemble the elk in any way. The true elk is a clumsy-looking beast, with broad antlers furnished with few tines. This animal was intermediate in character between the reindeer and the fallow-deer, but was much larger than either. Its antlers were magnificent, measuring as much as ten feet across from tip to tip, and weighing, with the skull, as much as a hundred pounds in some instances. The antlers have broad palms, and are furnished with a large number of tines. When, however, the palm is well developed, the tines are smaller and the spread of the horns less considerable. The name megaceros, big horn, is well suited to a creature whose head must have formed such a noble object. The height of the animal was about six feet at the shoulders, while the hind-quarters drooped only very little, so that it was somewhat taller than a horse. The most remarkable feature about the skeleton is the development of long processes on the dorsal vertebræ, which were undoubtedly intended as points of attachment for the muscles required to move the heavy head. The female had no horns, as is almost always the case in the deer family. This deer inhabited the outskirts of the forests, and its remains are found almost without exception in the marl at the outside of peat-bogs. In such abundance do they occur, that in one small bog near Lough Gur, in the county of Limerick, upwards of seventy heads were dug up in the autumn of 1864, in addition to a very large number obtained in previous years.

EARLY ACCOUNTS OF THE HUNTER'S SPORT.

In old Irish manuscripts there are frequent allusions to field sports; and in one of them particularly the descriptions of deer and deer-hunts are not uncommon. Most of these would suit red-deer as well as the animal which we are now discussing; however, one of them seems to refer to a deer with very large antlers, and to show that it was existing in the time of St. Patrick. The Irish name for the great deer was the Ox of the Deluge.

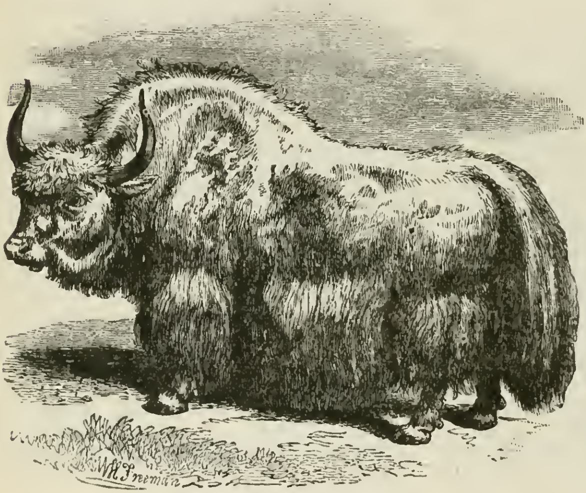
There is another remarkable animal that is common to the Arctic world. The musk ox is much smaller than the common ox, and has somewhat the appearance of an enormous sheep. Its forehead is arched; its mouth small; its muzzle completely covered with hair; and its horns, which are very large, are closely united at the base, and bending downwards over the sides of its head, suddenly turn backwards and upwards at the tips. Its long and abundant coat is of a dark brown color. It exhales a strong odor of musk, which even impregnates the flesh. This animal inhabits North America below the Polar circle, and lives in families of from twenty to a hundred individuals, among which there are seldom more than two or three males. In the month of August the latter become so jealous that they fight even to the very death. Notwithstanding its apparent heaviness, the musk ox climbs over rocks almost as nimbly as a goat, and its speed



EXCITING ENCOUNTER WITH THE MUSK OX.

across the rocky, rough, barren grounds, its principal habitat, for an animal so clumsy, is truly astonishing. It makes a spirited defence when assailed, and will toss the dogs that worry it in the air, as well as the hunter, if he makes the mistake of coming too near. Its long, thick, brown or black hair hanging down below the middle of the leg, and covering on all parts of the animal a fine kind of soft ash-colored wool, which is of the finest description, and capable of forming the most beautiful fabrics manufactured, enables it to remain even during the winter beyond seventy degrees of northern latitude. In spring it wanders over the ice as far as Melville Island, or even Smith's Sound. It is exclusively confined to the New World now, though that it was common at one time in Siberia is attested by the great number of fossil remains of the animal still to be found there. Its legs are short, but it runs with much speed and climbs lofty precipices like the Rocky Mountain goat. The animals go in herds of twenty or thirty, but are so scarce as to be seldom met with.

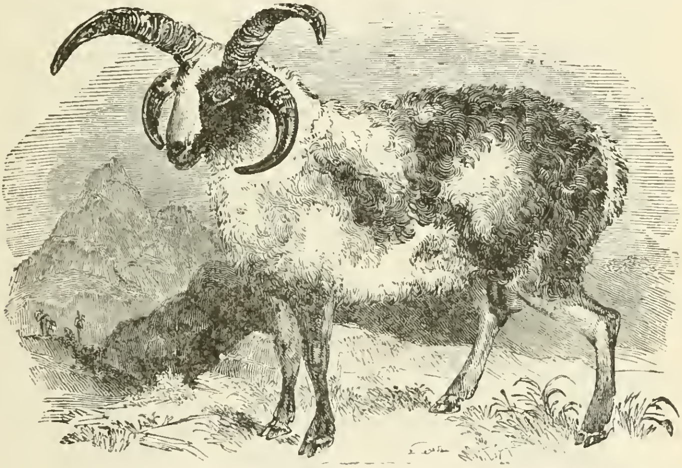
Somewhat like the musk ox in appearance is the yak which makes its home in Thibet. The yak likes to live on the cold snowy mountains. It has a clothing of soft curly hair almost like fur. Its tail sweeps the ground, and is of bright-colored hair. It has horns like a cow, and there is a hump between the shoulders. Its legs are very short; and sometimes its long hair will trail on the ground, and give it rather an awkward look. It is not fierce, though it does not like to be meddled with. The people of Thibet think the yak one of their greatest blessings. The milk of the cow is very thick and rich, and there is a great quantity of it. It makes excellent butter.



THE LONG-HAIRED YAK.

The mother yak is so fond of her young one, that when it is taken from her, she will not give any milk. The farmer's wife in Thibet knows what to do. The young yak has been killed; but she brings its foot, and lays it down before the mother for her to lick. The yak seems quite contented; and as she goes on licking the foot, she gives her milk as usual. The soft hair of the yak makes clothing when woven into a strong cloth. The shepherds who pasture their flocks in these cold regions wear a loose garment made of the hide of the yak. It hangs down to the knees, and is very warm and comfortable. At night they lie down upon it, and it serves them for a bed. The long hair is made into a tent-cloth, and also into ropes. The long, bright-colored tail is used for an ornament. Indeed, the whole wealth of some of the Tartar tribes in Thibet consists in this animal. The yak goes up and down the mountains, and does not often stumble. It carries burdens on its back; for the Tartars use it instead of a horse or a camel.

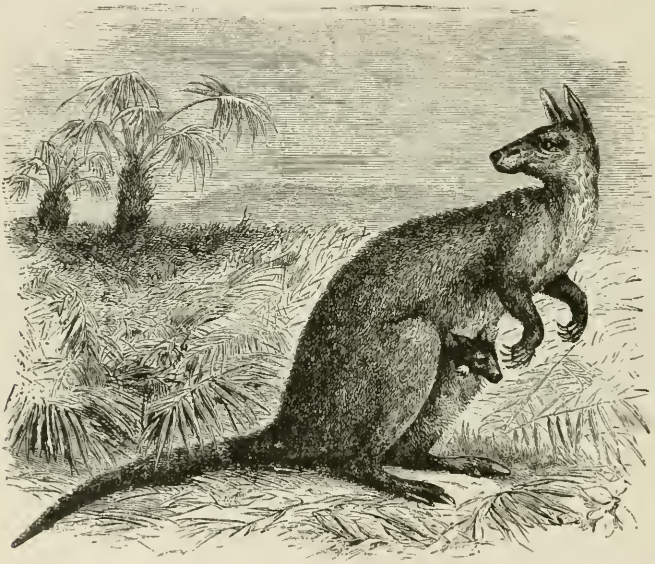
The goat is likewise remarkable for the agility it shows in climbing steep and difficult places, being made apparently to inhabit rocky regions and prove useful to men who make their abode in such localities. Dr. Clarke relates that when he was traveling from Jerusalem to Bethlehem, his party fell in with an Arab who had a goat, which he led about the country for exhibition. He had taught this animal, while he accompanied its movements with a song, to mount upon little cylindrical blocks of woods, placed successively one above the other, and in shape resembling the dice boxes of a backgammon table. In this manner the goat stood first upon the top of one cylinder, then upon the top of two, and afterwards of three, four, five and six, until it remained balanced upon the top of them all, elevated several feet from the ground, and with its four feet collected on a single point, without throwing down the disjointed fabric upon which it stood. Doctor Clarke adds, that this feat is very ancient. Nothing can show more strikingly the tenacious footing possessed by this quadruped upon the jutting points and crags of rocks; and the circumstance of its ability to remain thus poised may render this exhibition less surprising. It is seen frequently in mountainous countries, standing securely, though with hardly any place for its feet, upon the sides and by the brink of the most tremendous precipices. The diameter of the upper cylinder upon which its feet ultimately remained until the Arab had ended his ditty was only two inches, and the length of each cylinder was six inches. The most curious part of the performance occurred afterwards; for the Arab, to convince Doctor Clarke's party of the goat's attention to his tune, interrupted the music. As often as he did this the



THE AGILE SYRIAN GOAT.

goat tottered, appeared uneasy, and upon his master becoming suddenly silent in the middle of the song, fell to the ground.

For extraordinary muscular activity and ability to overcome apparent defects of organization, the kangaroo may be cited as a conspicuous example. The most prominent characteristic of the kangaroos is the relative disproportion of their anterior and posterior limbs. Whilst the former are short and weak, the latter are singularly long, thick, and strong. Thence the name macropus ("large foot"), which is given to this section of the animal kingdom. The tail is long and powerful, and constitutes a sort of fifth member, destined to facilitate in the kangaroos that mode of progression which is peculiar to them. There is a great disproportion between the anterior and posterior limbs, also the two bones called marsupial. Very curiously, however, in one of the arboreal kangaroos of New Guinea, the anterior limbs are even larger than the posterior; and in another species inhabiting the same country, the fore and hind limbs are about equal; while in a third New Guinea species the fore limbs are unusually large for an animal of this group. It is adapted to the locality it inhabits.



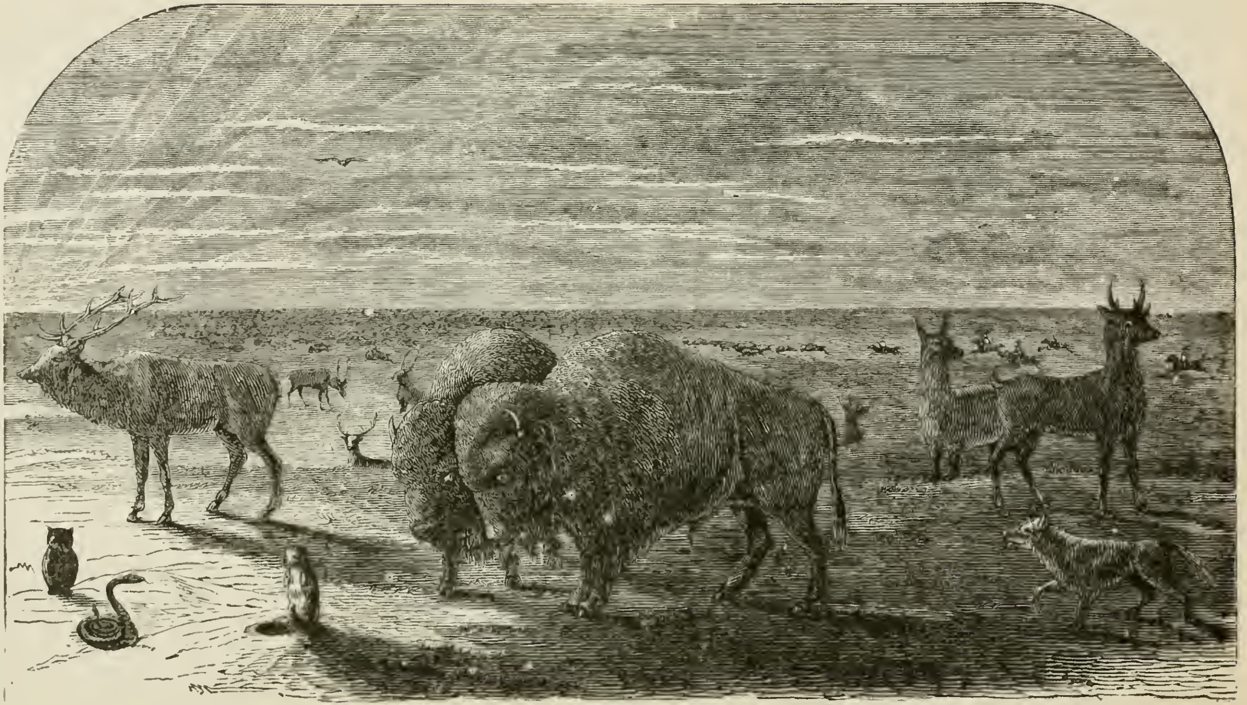
THE MARVELOUS KANGAROO AND HER YOUNG.

According to circumstances these animals walk or leap, and their tail plays a great part in either case. In walking they first place their four feet on the ground; then, leaning on those which are in front and on their tail, stretched out like a rigid bar, they raise their hinder parts, bringing up in the same time their two posterior close to their two anterior legs, and moving the latter forward to begin again the same manœuvre, and so on repeatedly. One can understand that they cannot move very quickly in this way, and so they have recourse to another expedient when they are pursued, or when they want to leap over any obstacle they find in their road. The fore legs then remain unemployed; they hang idly along the body. Squatting on its hind legs, the tail stiff and leaning on the ground like a prop, as it does when the animal is walking, the kangaroo bounds, as if it were propelled forwards by a spring, and alights a little further on, where it begins the same exercise over again, and thus on indefinitely, till it chooses to stop. The larger species of kangaroo clear as much as thirty feet in a single bound, and can jump ten feet in height. Nothing is more curious than to see them thus traversing space with almost the rapidity of arrows, and, like the giants we read of in mythology, receiving fresh vigor every time they touch the ground.

To complete the picture of the giant kangaroo, we must add that its muzzle is long and slender; its ears large and straight; its body thin in front, very massive, on the contrary, behind, that it possesses only four toes on the posterior extremities, and that one of these toes is provided with a most tremendous nail; that its coat is composed of silky hair on the head, the limbs, and the tail, and of woolly hair on the rest of the body; lastly, that in its diet it is essentially herbivorous. The female is provided with a curious pocket below the breast for carrying her young, one of those suitable provisions which show the work of design in creation, and of which there are so many.

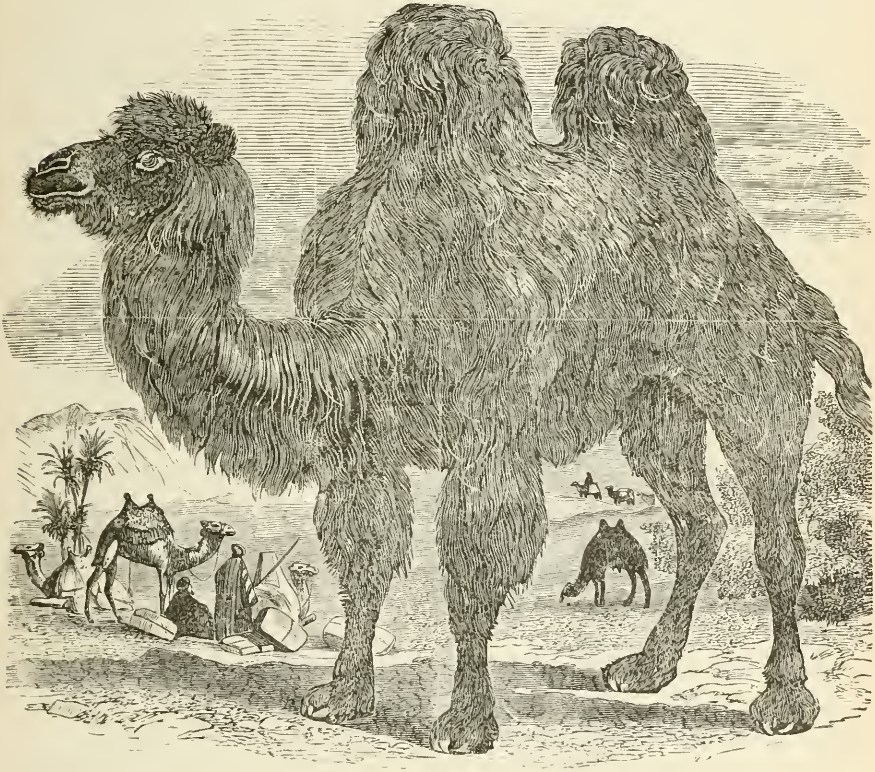
The animal is not a native of our own country, although it easily becomes acclimated, and flourishes in the temperate zone. We have, however, in our Great West a variety of animals, all of them wonderful in construction, nature and habits. They have a wide territory for their home, yet the steady advance of civilization is crowding them farther and farther away, and must ultimately sweep them from the plains. The buffalo, the fleet deer, the prowling wolf, the cunning fox, the prairie-dog, the various creatures that crawl or fly—all these abound in our own frontiers, where, as elsewhere, exploration has brought astonishing marvels to view.

We must go abroad, however, for that wonder of the desert—that patient, burden-bearing, long-enduring, strange-looking animal—the camel. The camels have a small and strongly-arched head. Their ears are slightly developed, still their sense of hearing is excellent. Their eyes, which have oblong and horizontal pupils, are projecting and gentle in expression, and are protected by a double eyelid. Their power of sight is very great. Their nostrils are situated at some dis-



THE ANIMAL WONDERS OF THE GREAT WEST.

tance from the extremity of the upper lip, and, externally, appear only as two simple slits in the skin, which the animal can open or shut at will. No trace is found round the nostrils of the camel, of the glandular body which forms the muzzle in other ruminants, and attains such development in the ox. Their upper lid is split down the centre, and the two halves are susceptible of various and separate movements, constituting a very delicate organ of feeling. They are also possessed of an extremely acute sense of smell. This remarkable head is carried with a certain degree of nobility and dignity on a somewhat long neck, which, when the animal moves slowly, describes a graceful arched curve.



THE WONDERFUL BACTRIAN CAMEL.

Their peculiar body, made more remarkable by the one or two humps on its back, is supported on four long legs, which appear slender in comparison with the mass they bear. In the Bactrian Camel the color of the coat is chestnut-brown, more or less dark. The hair grows to a considerable length, and becomes rather curly on the humps and about the neck. Below the neck it forms a fringe, which descends over the fore-legs. The dromedary, which is less massive in form and smaller in size than the camel, has a coat of brownish-gray, more or less dark; in some instances it is nearly bay. Its hair is soft, woolly and moderately long, more especially about its hump and neck. There are, however, peculiarities of coat characteristic of the different races. We must not omit to mention the callosities which camels have on their breasts, knees and insteps, as well as on their heels. Their feet are bifurcated. The two toes on each foot are not enveloped in horn, and have only on the last joint a somewhat short and hooked nail. A hard and callous sole covers the bottom of the toes, a characteristic which enables them to walk with ease on loose sand, where the elephant would be useless and the horse would soon exhaust its strength. The Bactrian camel is a native of ancient Bactria, now the country of the Usbecks. It principally lives in Asia, where it has been used from antiquity, for domestic and military service. In Africa, where it is acclimatized, it has doubtless existed since the time of the conquest of that country by the Arabs. The dromedary is distributed all over a great part of Northern Africa, and the major portion of Asia. It seems originally to have been a native of Arabia.

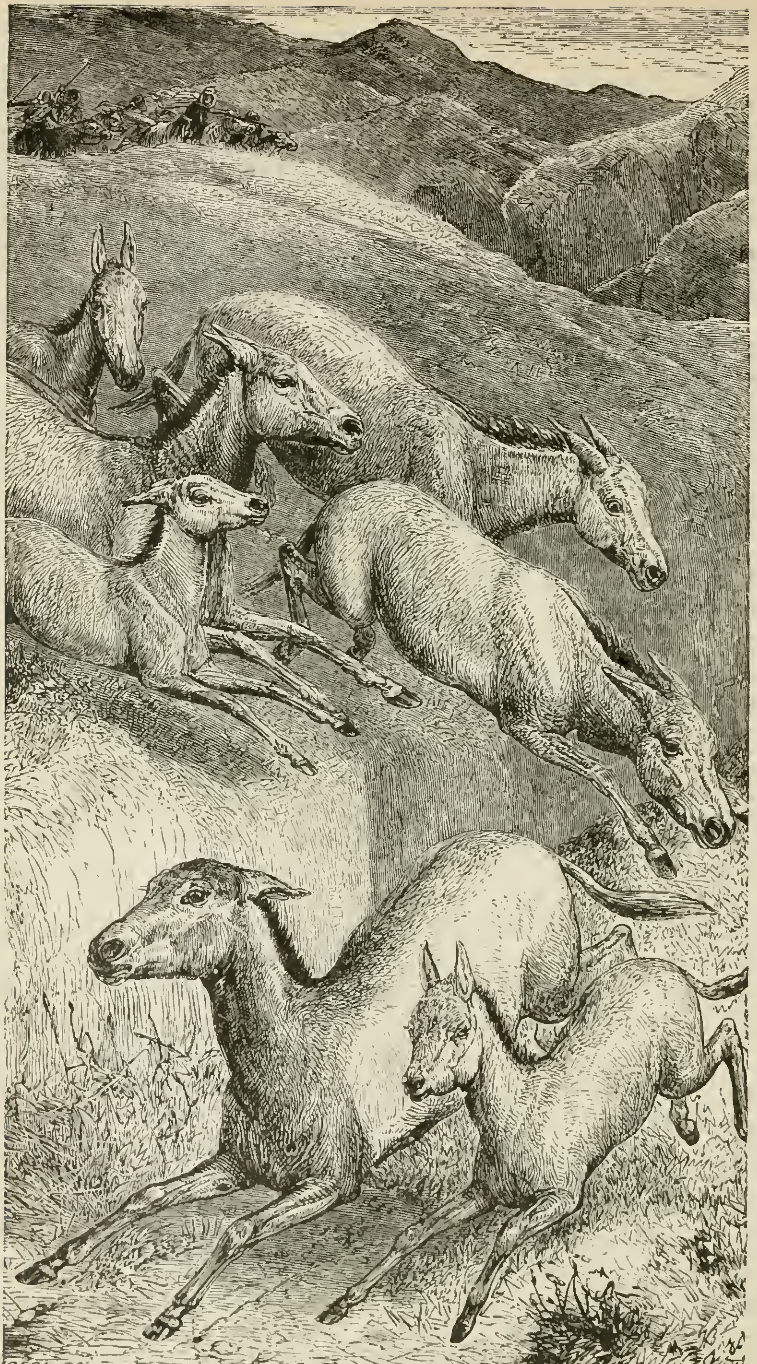
Buffon has said that gold and silk are not the real riches of the East, but that the camel is its chief treasure. In fact, this animal feeds the inhabitants of these countries, both with its milk and flesh, and furnishes clothes for them, fabricated from its long and soft hair. For centuries, sal-ammoniac, so useful to the manufacturer, was solely obtained from it. But it is chiefly as a means of conveyance and as a beast of burden that it renders the most important service to man. Without it those nations which are separated from one another by vast stretches of desert sand could not trade with each other. Without it the Arab could not inhabit those arid countries in which he dwells. With it, this "ship of the desert," as the eastern nations have called it in their figurative and symbolical language, life is possible even in such places as Buffon has called "the blank spots in nature."

From time immemorial the camel has been the only means of bearing commodities across the desert. By means of this patient and strong animal merchandise finds its way from the remote countries of Asia as far as the eastern confines of Europe. The rich products of Arabia, in ages past, were brought to Phœnicia on the backs of camels; and in our time, in the same way, merchandise is borne to Alexandria, from whence it is distributed over the European continent. The better to fit the camel for its arduous life, the Arab trains it to do without sleep, and to suffer all the extremes of hunger, thirst and heat. A few days after its birth its legs are bent under its stomach, and it is compelled to remain crouched upon the ground, laden with a suitable weight, which is gradually increased with its age. As it arrives at maturity, its food is restricted, and given at longer intervals; it is also practised in running and enduring severe exercise. Yet it knows when it is abused, and, sometimes, like the elephant, it retaliates. A valuable camel, working in an oil mill in Africa, was severely beaten by its driver. Perceiving that the camel had treasured up the injury, and was only waiting a favorable opportunity for revenge, he kept a strict watch upon the animal. Time passed away; the camel, perceiving that it was watched, was quiet and obedient, and the driver began to think that the beating was forgotten, when one night, after the lapse of several months, the man was sleeping on a raised platform in the mill, whilst, as is customary, the camel was stabled in a corner. Happening to awake, the driver observed by the bright moonlight that, when all was quiet, the animal looked cautiously around, rose softly, and stealing towards a spot where a bundle of clothes, thrown carelessly on the ground, resembled a sleeping figure, cast itself with violence upon them, rolling with all its weight, and tearing them most viciously with its teeth. Satisfied that its revenge was complete, the camel was returning to its corner, when the driver sat up and spoke. At the sound of his voice, and perceiving the mistake it had made, the animal was so mortified at the failure and discovery of its scheme, that it dashed its head against the wall.

A MUCH-ABUSED AND RIDICULED ANIMAL.

Quite as wonderful as the camel is the plain and homely ass, whether we consider its burden-bearing qualities or its disposition. Why, says Buffon, very justly, is there so much contempt for an animal so good, so patient, so abstemious and so useful? Can it be that men despise, even in animals, those who serve them too well and at too little expense? We confer on the horse a degree of education; he is cared for, he is trained and he is exercised, whilst the ass is handed over to the mercy of the lowest servant, or to the malice of children, and, so far from improving by education, he must almost always be the worse for it; if he did not possess a large supply of good qualities he would, in fact, lose all in consequence of the treatment which he receives. He is too frequently the plaything, the butt and the drudge of his owner, who drives him, beats him, overloads him and tires him out, without care and without mercy. There seems to be no attention paid to the fact that the ass would be the best and most useful of animals, if there had been no such animal in the world as the horse.

While the horse is full of pride, impetuosity and ardor, the ass is mild, humble and patient, and bears with resignation the most cruel treatment. Most abstemious in its habits, it is content with the coarsest

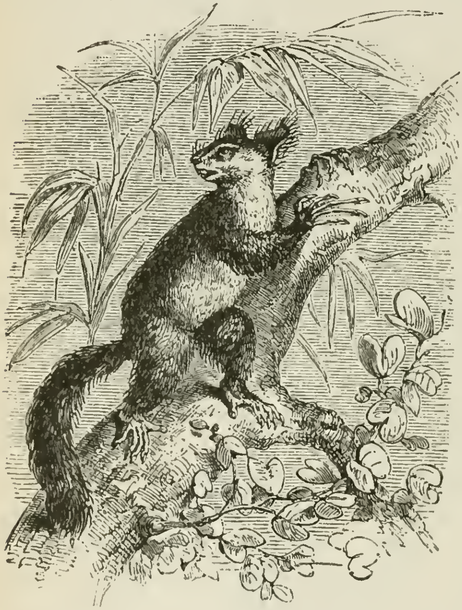


DARING LEAP OF WILD ASSES IN FLIGHT.

herbage, which other beasts will not touch, even such as thistles and weeds. A small quantity of water is sufficient for it, but this it requires pure and clear. It will not, like the horse, wallow in mud or water; and as its master too often forgets to groom it, it performs this duty by rolling itself on the turf or the heather when opportunity offers. It has sharp sight, an excellent sense of smell and an ear of keen acuteness, If it is laden too heavily it remonstrates by drooping its head and lowering its ears. When it is teased, it opens its mouth and draws back its lips in a disagreeable manner, giving it a mocking and derisive air. The ass walks, trots and gallops like the horse, but all its movements are shorter and slower. Whatever pace it employs, if too hardly pressed, it soon becomes tired; if not hurried, it is most enduring. It sleeps less than the horse, and never lies down for this purpose except when worn out with fatigue. It never utters its long and discordant cry, which passes in inharmonious succession from sharp to flat and from flat to sharp, except when hungry, or expressing amorous feelings.

MORE THAN A MATCH FOR WOLVES.

The ass carries the heaviest weight in proportion to its size of all beasts of burden; it costs little or nothing to keep, and requires, so to speak, no care; it is a most useful auxiliary to the poor man, more especially in rugged mountainous countries, where its sureness of foot enables it to go where horses could not fail to meet with accidents. It is, therefore, the horse of those of small means; the abstemious and devoted helper of the poor. It suffers with resignation under the tyranny of its oppressors. In energy, in nervous power, and in temperament, the ass even surpasses the horse. It is also superior to the latter in docility, abstemiousness, and capacity to endure fatigue. The wild ass, in its shape and proportions, takes the middle place between the horse and the ass. It resembles a mule, but its legs are more slender, and its carriage is lighter. The general color is dun, the main and dorsal stripe black, and the tail is terminated by a black tuft. This animal inhabits the sandy deserts of Asia, especially those of Mongolia, or the plains north of the Himalaya. In their periodical migrations they come down as far as the Persian Gulf and Hindoostan. To the north, they do not go beyond the forty-fifth degree of latitude. They live together in innumerable droves, and travel under the guidance of a leader, whom they obey with intelligent submission. If they chance to be attacked by wolves they range themselves in a circle, placing the weak and younger members in the centre, when they defend themselves so courageously with their fore-feet and teeth that they almost invariably come off victorious. The Tartars capture them to get possession of their skins; they also eat their flesh, which is considered excellent. The wild ass is endowed with a sure foot and great swiftness, but it is difficult to tame. In order to capture them, snares and nets made of cord are placed around the places where they are in the habit of coming to drink. Larger than the domestic animal, the wild ass has a narrower chest, lighter body, and shorter ears. Its legs are also long, the forehead arched, the head lean, which it carries erect, like the horse. The top of the head, the sides of the neck, the flanks, and the croup are of a dun color, with stripes of dirty white; the mane is black; there is a coffee-colored line along the back, which widens on the croup, and, in the males only, is crossed by another band on the shoulders. In the books of Moses the wild ass is mentioned, so that it was well-known to the ancients. It also figured in the festivals which the Roman emperors gave to the people to make them forget the loss of their liberty and their departed grandeur.


THE SINGULAR AYE-AYE.

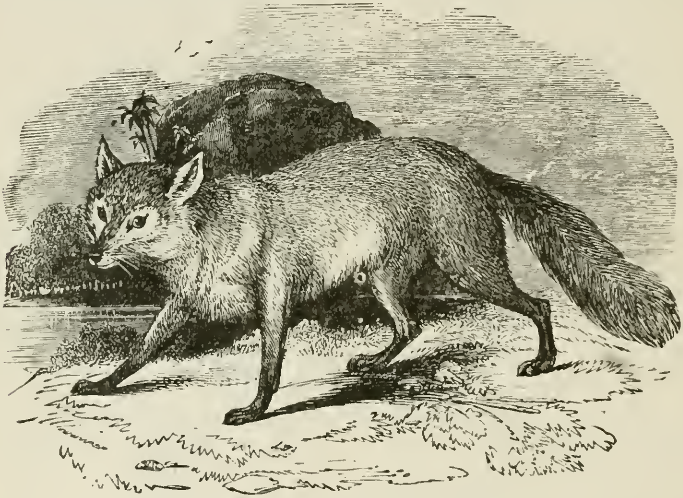
A remarkable specimen of animal life is found in one of the tropical islands. The aye-aye is a native of Madagascar, which Sonnerat discovered in that island towards the end of the eighteenth century. This singular animal, which is very rare, was not even known at that period to the people of Madagascar, and the name of aye-aye given to it by Sonnerat was due to the exclamation of the natives of that island when this traveler showed it to them for the first time. At first sight the aye-aye shows some striking points of resemblance to the squirrels: it has their general form, the long bushy tail, and especially their dentition. It has, in fact, no canine teeth, but possesses in front of its jaws, a pair of strong incisors, isolated from the molars by a vacant space, similar to the gap occurring in the squirrels and other animals belonging to the order of rodentia. But, on the other hand, the large size and rounded form of its head, indicative of a voluminous brain; the conformation of its limbs; the length of the digits, and the opposable thumb in the posterior members; the complete state of the bony circle of the orbit; the exisence of only two mammæ in the female; are characteristics which assimilate the aye-aye to the lemurs. The habits of the aye-aye are very little known; Sonnerat said that it used its long front toes to dig into the bark of trees, where it found the insects on which it fed. Nevertheless, some particularities in its dentition lead to the belief that it also eats fruit. Sonnerat kept a pair of aye-ayes alive for two months. I fed them, he says, on boiled rice, and to eat this they used the slender toes of their fore-feet, as the Chinese use their chopsticks. They were drowsy-looking, and sleep with their heads placed between their fore-legs; it was only after shaking them several times that they waked up

AN EAVESDROPPER WITH BIG EARS.

What a strange physiognomy is given to the skull of the little rarity by the enormous, curved, chisel-shaped pair of teeth at the fore part of the upper and under jaws! What can be the meaning of that long-shrivelled middle finger on each of the hands? It looks like a bent probe, only there is a hook at the end. This quadruped is stated to sleep during the heat and glare of the tropical day, and to move about chiefly at night. The wide openings of the eye-lids, and the whole construction of the eye, are arrangements for admitting to the retina, and absorbing the utmost amount of the light which may pervade the forest at sunset, dawn or moonlight. Thus the aye-aye is able to guide itself among the branches in quest of its hidden food. To detect this, however, another sense had need to be developed in great perfection. The large ears are directed to catch and concentrate, and the large acoustic nerve, seemed designed to appreciate any feeble vibration that might reach the tympanum from the recess in the hard timber through which the wood-boring insect on which it feeds may be tunneling its way by repeated scoopings and scrapings of its hard little jaws.

No less singular than the aye-aye is the four-footed animal that flies, a fox endowed with wings. The flying fox is a very curious inhabitant of the forests near Moreton Bay, in East Australia. It lives in flocks, and moves generally towards the dusk of the evening, and the noise produced by the heavy flapping of the so-called wings is very singular. The flocks like quiet places where there are large Araucarian pine trees, with an underwood of scrub and creepers. The foxes hang in vast numbers from the horizontal branches of the pine trees. When there is a clear space amongst the trees, an enormous number of the animals may be seen, and their noise can be heard; for directly they see anything unusual, they utter a short bark, something like the sound made by young rooks. Often every branch is crowded, and the flying foxes are seen either flapping their wings, and holding on with their hind feet, and with their head downwards, or snarling and fighting for places. Suddenly the whole take to flight, and flap their furry, wing-like sides, and wheel around like heavy birds. Many fly with their young holding on to them. The creature is not a true fox, and there is a fold of skin which reaches from the fore to the hind legs. This is called the wing, and it enables the pteropus, as the animal is called, to float and turn in the air.

The ordinary fox, as he is known among us, has always been notorious for his cunning. He has a way of looking out for himself, and is not wanting in shrewdness. Many facts showing this are on record. The proverbial cunning of a fox is well illustrated in the following anecdote: I have been assured by a person not given at all to exaggerate, nor easily deceived, that he once witnessed the following trick. Very early one morning he saw a fox eyeing most wistfully a number of wild ducks feeding in the rushy end of a highland lake. After due consideration, the fox, going to windward of the ducks, put afloat in the lake several bunches of dead rushes or grass, which floated down amongst the ducks without causing the least alarm. After watching the effects of his preliminary fleet for a short time, the fox, taking a good-sized mouthful of grass in his jaws, launched himself into the water as quietly as possible, having nothing but the tips of his ears and nose above water. In this way he drifted down among the ducks, and made booty of a fine mallard. Though this story seems extraordinary, it must be remembered that the fox manages to capture wild ducks, wood-pigeons, hares and numberless other animals, sufficient to keep himself and family; and it is self-evident that in doing so he must practise many a trick and manœuvre that would seem most improbable if re-



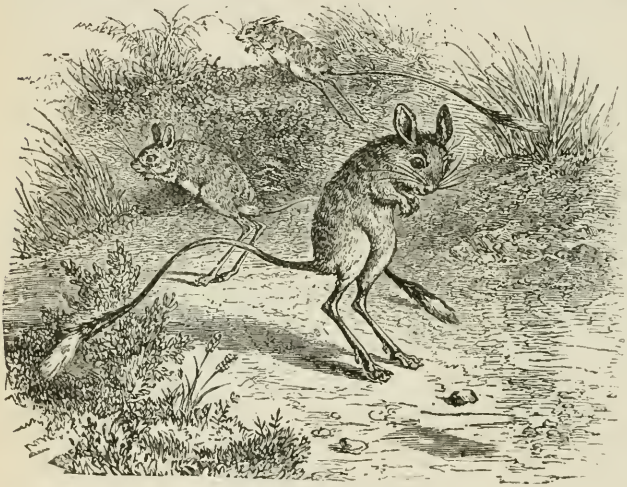
AN ANIMAL NOT TO BE TRUSTED.

lated, and quite beyond the instinct of animals. Another anecdote, quite as striking as an illustration of the fox's wonderful sagacity, appeared, a few years back, in a Preston paper. A farmer of that neighborhood had discovered that a fox came along a beam in the night to seize his poultry. He accordingly sawed the end of the beam nearly through, and in the night the fox fell into a place whence he could not escape. On going to him in the morning, the farmer found him stiff and, as he thought, lifeless. Taking him out of the building, he threw him on the ground, but in a short time Reynard opened his eyes, and, seeing that all was safe and clear, galloped away to the mountains, showing more cunning than the man who ensnared him.

Other animals are sagacious and seem to know how to reason, but are not conspicuous for cunning. At certain seasons of the year the streams in some parts of North America, not far from the coast, are filled with fish to a surprising extent. A real Newfoundland dog, belonging to a farmer who lived near one of those streams, used to keep the house well supplied with fish. He thus managed it: he was perfectly black, with the exception of a white fore-foot, and for hours together he would stand almost immovable on a small rock which projected into the stream, keeping his white foot hanging over the ledge as a lure to the fish. He remained so stationary that it acted as a very attractive lure; and whenever curiosity or hunger tempted any unwary fish to approach too close, the dog plunged in, seized his victim, and carried him off to the foot of a neighboring tree; and on a successful day he would catch a great number.

The jerboas are pretty little animals, with a large head, prominent eyes and wide ears. Their front legs are very short, with only four toes at the extremities, fitted for digging. The hind legs are five or six times longer than the front ones, and are terminated by three or five toes, according to the species. This kind of organization recalls to mind that of the jerboa rats; but their long legs make them much more striking. The tail is long and covered with short hair, and terminated by a tuft; the coat is soft and thick. The jerboa inhabits the vast solitudes of Africa, and the steppes of Tartary and Russia. They dig out burrows, in which they pass the day, sleeping on a bed of grass and moss. But in the evening they seek their food, which consists of roots and seeds. They make use of their fore paws to convey what they eat to their mouths, in this respect resembling the sprightly squirrel.

Under ordinary circumstances, when nothing occurs to hurry or excite them, the jerboas walk on all fours; but if, from the scarcity of sustenance, or the necessity of escaping from danger, they are compelled to go a considerable distance in a short space of time, they use their hind legs only, moving forward in leaps, like the jerboa rats; but the span of their bounds is of much greater extent, reaching sometimes to three yards. The way in which these springs are made is very curious. The animal first crouches down, at the same time stretching out and stiffening its tail, so as to make another bearing-point on the ground; then, suddenly, it bounds forward, as if forced by a spring. The same manœuvre is repeated after an imperceptible interval of time. It is said that the jerboa can compete in speed with a fast horse. The ancients, looking at this peculiar mode of progression, were led to think that the fore-legs of these rodents were absolutely unfitted for walking, and for this reason gave them the name of dipus, which signifies two-footed. Jerboas are difficult to tame; they can, however, be kept in strong cages.

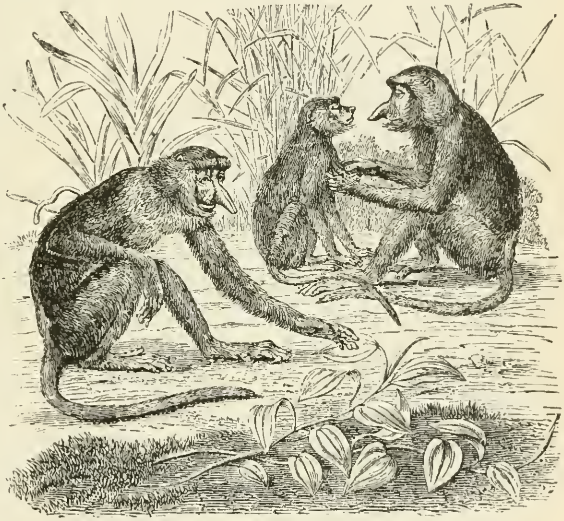


THE FAMOUS JERBOA.

Very strange are proboscis monkeys, so named because of their nose, which surpasses in length that of mankind. This is a peculiarity which distinguishes them from all other known monkeys. They are also recognized by their hair, which is more developed beneath the chin and around the neck than on the other parts of the body. These animals are the largest of their species, measuring nearly four feet when standing upright. They are also the most ferocious and least susceptible of training. They inhabit the island of Borneo, and are found in numerous troops among the woods in the neighborhood of streams. It is rare to see them on the ground, nearly the whole of their lives being passed on trees. Up to the present time only one long-nosed species has been discovered.

The natives of Borneo pretend that the proboscis monkey, or, as sometimes called, Kahau, is a man who has retired to the woods to avoid paying taxes, and they entertain the greatest respect for a being who has found such ready means for evading the responsibilities of society, and escaping the clutches of the law.

Pliny alludes to the fact that white monkeys are occasionally found in India; but it has generally been supposed that the specimens seen were albinos. Sir Emerson Tennent had one brought to him in Ceylon, which certainly could not have been an albino, as it had a black face and black eyes, all the rest of the body being white. He was told by the natives that this kind was not uncommon. Others are occasionally found entirely white, face and all. The Rev. R. Spence Hardy mentions in his work on Eastern Monachism, that on the occasion of his visit to the great temple of Dambool, he met with a troop of white monkeys on the rock where the temple is situated. There can be no doubt of the fact, therefore, that white monkeys are really one of the varieties of the race.


THE STRANGE PROBOSCIS MONKEY.

The guenons are slender monkeys, which have the cranium depressed, and show no forehead—at least at an adult period of life; they have large paws, marked callosities, long, sharp canine teeth, well-formed extremities for prehension, a long elevated tail and a thick and more or less speckled coat. Naturalists usually designate them by the name of Cercopitheci, which means tailed monkeys. The genus comprises about thirty species. These animals live in troops in the forests; they are constantly moving about from tree to tree, and with an extraordinary facility execute the most wonderful capers. In each troop there is a sentry intrusted to watch over the general safety. On the appearance of an enemy, this vedette gives a particular cry, and all the band, collecting in the highest places they can find, at once prepare to repel the intruder. Fruits and branches are then hurled down at the aggressor, who, disarmed and helpless against this aerial horde, is soon compelled to take to flight. The negroes find this kind of skirmishes but little to their taste, and, therefore, rarely trust themselves in those parts of the forests where the guenons have established their domicile. The largest quadrupeds, not even excepting the elephant, are not exempted from these attacks, and find it advisable to evade by flight the disagreeable, if not dangerous, consequences of such conflicts. There are only two beings capable of contending successfully with them; these are man, with his bow or firearm, and the serpent, which creeps in the darkness to the highest branches of the trees, and in this way contrives to circumvent and seize these dwellers of the forests.

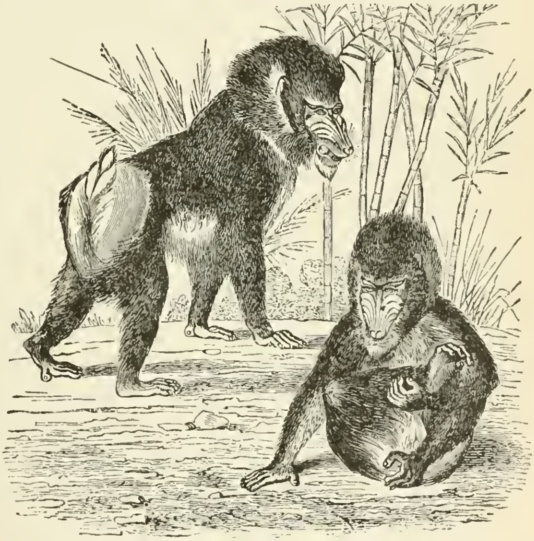
The food of the monkeys is varied; they chiefly live on roots, leaves and fruits. They also eat the eggs of birds, insects, sometimes even mollusks, and they are particularly partial to honey. They devastate gardens and plantations, and appear impelled to commit these acts of brigandage as much from an instinct for thieving and pillage as from the demands of hunger, for they destroy and damage all that they cannot carry off. They go about the destruction of gardens in the same manner as the magots; that is to say, they charge some one of their number to collect the spoil, which is quickly passed from hand to hand. The surprise of the planter who finds himself face to face with this pillaging tribe may be left to the imagination.

They have a singular aptitude in passing from gaiety, which is otherwise their usual state, to melancholy, from melancholy to joy, and from joy to anger, in a few seconds, and from the slightest causes. We see them ardently desirous of obtaining a certain object, testifying the liveliest pleasure if allowed to possess it, and almost immediately after throwing it away with indifference, or breaking it in a fit of rage. We also see them delighting in the society of another animal, evincing in their own way the most tender regard for it, and then suddenly becoming irritated, pursuing it with hoarse cries, and biting it as if it were an enemy; immediately peace is made, and the caresses recommence and continue, until a new caprice brings about the same results.

Perhaps no more singular animal in appearance was ever created than the mandrill. Baboons almost exclusively inhabit Africa, a single species only being found in Asia. They live either in forests, or low mountainous rocky localities, and subsist on fruits and insects. In captivity they are almost omnivorous The mandrill is characterized in the first place by a very short tail, and in the second by deep wrinkles on each side of the nose, and which are more or less brilliantly colored. Indeed, the mandrill is one of the cynocephali whose colors are the brightest. It has the face streaked with brilliant red, blue, and black bands. The upper part of the thigh is of a bright red, mixed with blue, and very peculiar in appearance. It is remarkable that these diverse colorations are not permanent, but disappear when the animal is in bad health.

The mandrill, when old, is vindictive and malicious. Even when taken young, and supposed to be tame, it should never be trusted. Captivity does not in any way tone down the violence of its character. Yet among these animals there are some which preserve their docility for a long time. We have an instance of this in the one exhibited in London, which, in consequence of its intelligence, acquired considerable reputation. This monkey, named Happy Jerry, seated himself with an air of hauteur in a carriage, drank porter out of a pewter pot, and smoked a pipe with all becoming gravity. The baboon was known to the ancient Egyptians, on whose monuments it often appears. It symbolized the god Thoth, the inventor of the alphabet, and for this reason it was held in great veneration. Numerous mummies of this animal have been found in Egyptian burial-places. At the present time they make a less noble figure in society. The Orientals train it to perform various tricks, and exhibit it in public. It is a native of Abyssinia, Sennaur, and Arabia.

The monkey tribes, although bearing a form and resemblance suggestive of man, do not possess the amount of intelligence, or sagacity, which belongs to several other species of animals. The elephant is not only a marvel in size and construction, but also in certain qualities of a higher order, far superior to every other animal.


THE MARVELOUS MANDRILL.

The enormous physical strength of the elephant is scarcely so wonderful as the extreme sagacity with which he often exercises it. At Malire, on the coast of Malabar, M. Toreen relates that he had the opportunity of witnessing a remarkable instance of this. An elephant had been hired out for a certain sum per day, and its employment was to carry with its trunk timber for a building out of a river. This it did very dextrously under the command of a boy, laying the pieces one upon another in such exact order that a man could not have done better. A traveler saw a ship in course of construction at Goa, and at a short distance from it a number of heavy logs of wood. The men engaged in the work fastened a rope to the end of the beam that required moving, and handed the other end of the rope to an elephant, who twisted it round his trunk and dragged the timber to the ship without any conductor. One of the elephants sometimes drew beams so large that twenty men could not have moved them. What is still more surprising, when other pieces of timber lay in his way, the elephant had the sense to lift up the end of his own beam, and run it over them with the intelligence of a human being.

Some years ago two elephants, a male and female, were taken from the menagarie of the Prince of Orange, at the Hague, to Paris, to a place suitably prepared for their reception. The inclosure, formed of strong and thick beams, was in two divisions or apartments, separated by a gate. The male elephant entered first, and looked suspiciously about him. He then proceeded to examine every bar with his trunk, as if trying their solidity. They were held together by large screw-bolts, the heads of which were outside ; these the elephant found out, and tried to turn the screws, but was not able. When he came to the gate between the two apartments, he soon discovered that it was only secured by an iron bar which rose perpendicularly. He raised it with his trunk, pushed up the door, and entered into the second apartment, where he found a breakfast had been prepared for him, with which he made himself quite comfortable.

From the instances of sagacity and strength already related, it may be inferred that the elephant can be trained to perform almost any suitable task in the absence of his master. M. d'Obsonville relates that he saw two elephants engaged by themselves in breaking down a wall in accordance with orders previously received, the reward for which they well knew was to be a dessert of fruits and brandy. Their trunks were protected from injury by leather, and they had the sagacity to combine their efforts. Doubling up their trunks, they thrust against the strongest part of the wall, carefully observing and following with their eyes what effect they produced upon its equilibrium. At last, when it was sufficiently loosened, they made one violent push together, and, on their suddenly drawing back, that they might not be hurt, the wall came tumbling to the ground, but they were out of danger.

THE WONDERFUL WHITE ELEPHANT.

Among the animals which in various countries have been the objects of superstitious veneration, few have ever received the attention accorded in the kingdoms of Siam and Ava to a white elephant. Such an animal, when he makes his appearance in the forest, is regarded as sacred ; no effort is spared to capture him, and when caught he is housed in regal state, a long train of attendants being allotted to his service. "King of the White Elephants" is considered one of the proudest titles of which the monarchs of these countries can boast; and fierce wars have been waged for the possession of one or more of the beasts. They are looked upon as the symbol of all kingly authority, and to be without one would be taken as an indication of the displeasure of heaven, and a certain omen of disaster.

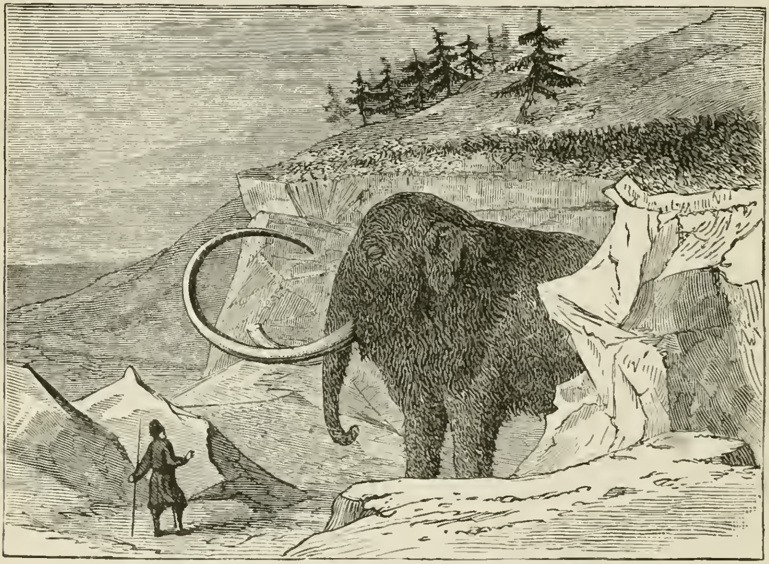
In Ava, especially, the white elephant is held in the highest honor. He bears the title of "lord," and is ranked next to the king and before the queen in dignity. His house is sumptuously decorated, and he has a minister of high rank to superintend his household. When there are two or more of these animals in the possession of the king at the same time, all are treated with similar care.

Their food is given them in vessels of silver gilt. Every day when they go to the river to wash, each goes under a canopy of cloth of gold, or silk, carried by six or eight men; and eight or ten men go before each, playing on drums and shawms, and other instruments. When each has washed, and is come out of the river, he has a gentleman to wash his feet in a silver basin, which office is appointed by the king. There is no account made of the black elephants, be they ever so great; and some of them are wonderfully large and handsome.

For the maintenance of these elephants, one of the finest provinces in the kingdom was allotted by a recent sovereign of Burmah. As, professedly, a mark of high esteem, the monarch has occasionally entrusted the keeping of a white elephant to one of his nobility; but the expense involved in the charge has been, now and then, so great as to ruin the unlucky recipient of this doubtful honor. Hence, "to have a white elephant to keep" has become a common saying when a person has an expensive and unprofitable dignity or undertaking upon his shoulders.

The mammoth, or hairy elephant, is extinct, and a live one has never been seen since men have known how to read and write; but its bones are found over the whole of Europe, Northern Asia, and North America. The elephants now living are the African with large, and the Indian with small ears; these are both dwellers in hot climates, and would die if left to themselves even in the temperate countries of Europe. But the hairy mammoth was an elephant which lived in cold and temperate climates, and it is a most interesting creature, because its teeth, tusks, and bones, which are by no means uncommon in old bogs, gravel-pits and brick-fields, are often associated with the weapons of the first men who traveled from the East to colonize Europe, then a country full of wild beasts. It is supposed that the mammoth lived amongst the forests of the great plain of Siberia, and that it was often overtaken by floods and drowned. The carcases would float until covered with ice, gravel, and sand, and would generally decompose, and only the tusks and bones would be left. Thousands of mammoth tusks had been found in Siberia before the chief discovered the whole animal, and it is believed that there are as many more mammoths still covered up in Siberian gravel and mud as there are living elephants in India and Africa.

Doubtless the mammoth was larger than the elephant, but it fell beneath the constant attacks of savage men; and, moreover, it lived in regions where the rivers were constantly flooded and loaded with stony sediment, and where bogs were common. It died out very early in the history of man, but it lived when Europe was very different to what it is now. Many animals, some still living and others extinct, roamed through the country with the mammoth. There was a great tiger, a hyena, a rhinoceros covered with hair, the reindeer, and many kinds of bears. These companions and enemies of the mammoth left their bones in the earth, and were either destroyed by men or died off from alterations in the climate. The mammoth had teeth which were coarser in structure than those of the elephant, and it fed upon tougher food; its hairy coat, so different from the skin of the existing elephants, adapted it for a cold climate, and its tusks are sold by the thousand for ivory. Even in North America, on the shore of Behring's Straits, the frozen cliffs of mud and sea break away and disclose ivory tusks and mammoth bones, and lately, in making explorations in Rome,



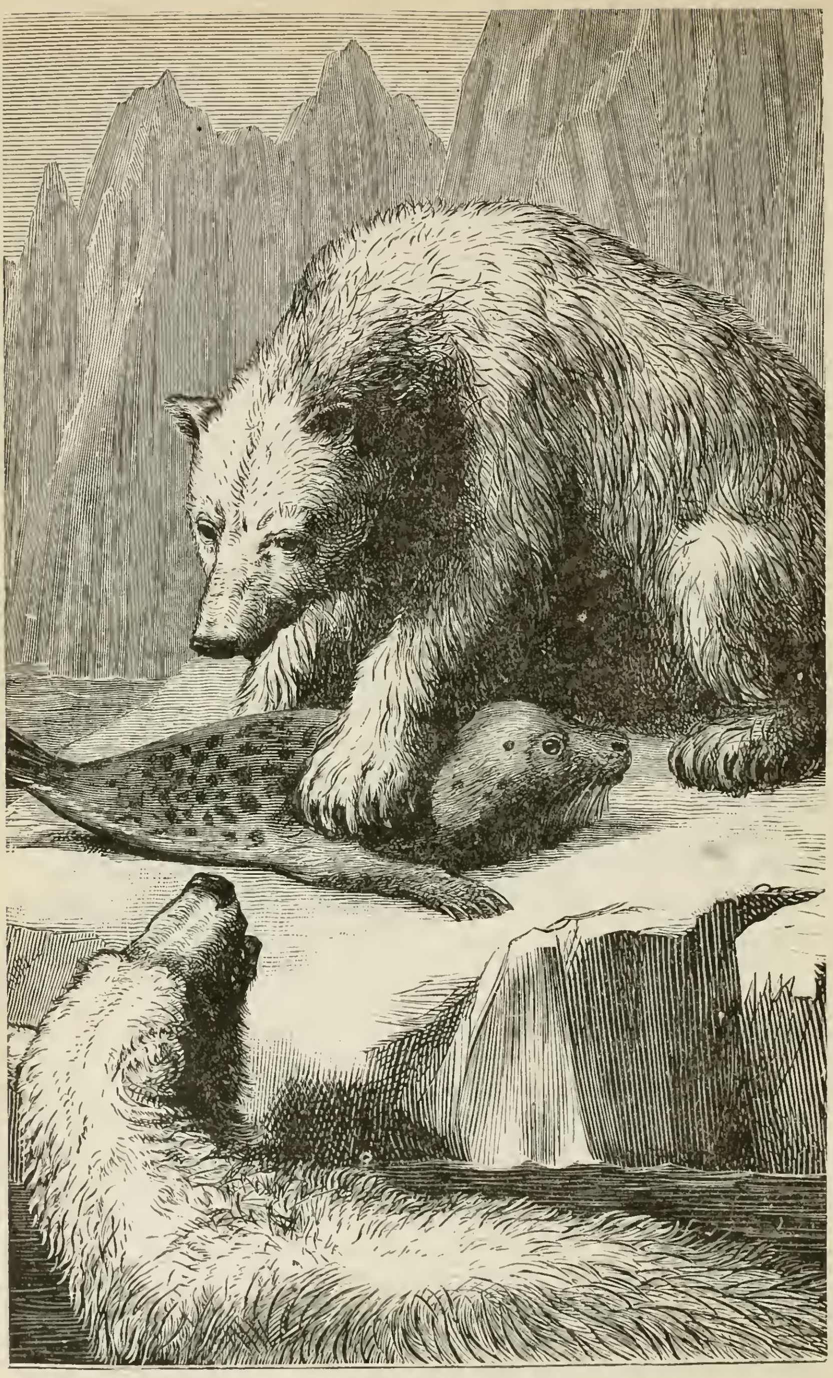
WONDERFUL DISCOVERY OF THE MAMMOTH.

mammoth bones were discovered in the mud by the side of the Tiber. Its teeth are common in England, and a great skull was found at Ilford, in Essex. An elephant fitted to live in a cold climate appears at first to be a very strange thing, but it must be remembered that the zebra can only live wild in hot climates, though the horse lives in cold; and the buffalo can only flourish in the warm countries, yet the ox, his near relation, does very well in Europe.

To the mammoth we must add the famous gigantic mastodon of Ohio. Whilst the mammoth has its tusks excessively curved round, the mastodon has almost straight tusks; the molar teeth differ also in each of these species. The bony remains of species of mastodon are found in the middle of America and in Central Europe.

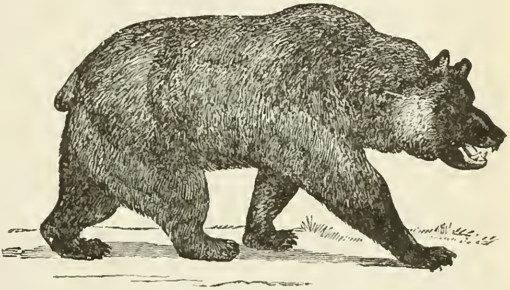
Other extinct animals were equally remarkable. There are some hills in the East Indies, close to the great Himalaya mountains, which have large bones in them. These bones are found at some depth from the surface of the ground, and are of enormous size. They were washed down from higher ground by floods out of the bogs and marshy land, like those into which large animals, even at the present day, constantly stray and get drowned. One of the most wonderful animals whose bones are preserved in these hills is an immense tortoise. It is now extinct, and died out at the same time as a gigantic cameleopard and many kinds of immense elephants whose bones are very common in the same place. It was a tortoise which had a shell six and a half inches thick, twelve feet long, eight feet broad and six feet high. There is a curious legend which states that the world is supported on the back of an elephant, and that this creature rests on the back of a great tortoise; and it is from this legend that the creature has obtained the name of Atlas.

There are animals, however, that are never found in their native state outside of certain latitudes. One of these is the Polar bear. It has a reputation for boldness and voracity. Doubtless much of its ferocity is to be attributed to the barrenness of the regions which it inhabits, the absence of vegetation obliging it to attack animals to supply its craving appetite. Its domain includes all those solitudes which surround the Arctic Pole—Greenland, Spitzbergen and Nova Zembla. Over these vast icefields it reigns supreme. It pursues the walrus and the seal, which it catches with ease, for it both swims and dives with extraordinary skill. White bears also feed on such dead fish and cetacea as the sea throws upon the beach. In the summer time, when they betake themselves to the forests further inland, they attack the mammals which are natives of these regions, especially reindeer. But notwithstanding their apparent love of flesh, they are able to subsist upon vegetable diet.



THE FIERCE POLAR BEAR AND HIS PREY.

Most mariners who have been detained by the ice in the Polar seas have had frequent encounters with white bears. Instances have been known in which they pursued them into their vessels, even endeavoring to make their way into cabins at night through the portholes. The white bear is terrible in its attack. Accustomed as it is, to meet with little or no resistance, and not even suspecting danger, it rushes upon man with a blind fury and determination too often fatal in their results. It is not an uncommon thing for white bears to drift out to sea on floating icebergs, when they become reduced to the most frightful distress from hunger. Fatally confined to their icy raft, and utterly devoid of all means of subsistence, they ultimately attack and devour one another. Some of these famished bears have been drifted to the coasts of Iceland, and even Norway. They are then indeed terrible, and make an indiscriminate rush on anything before them, be it man or brute. Circumstances of this kind have certainly contributed to form the reputation they have acquired of untameable ferocity.



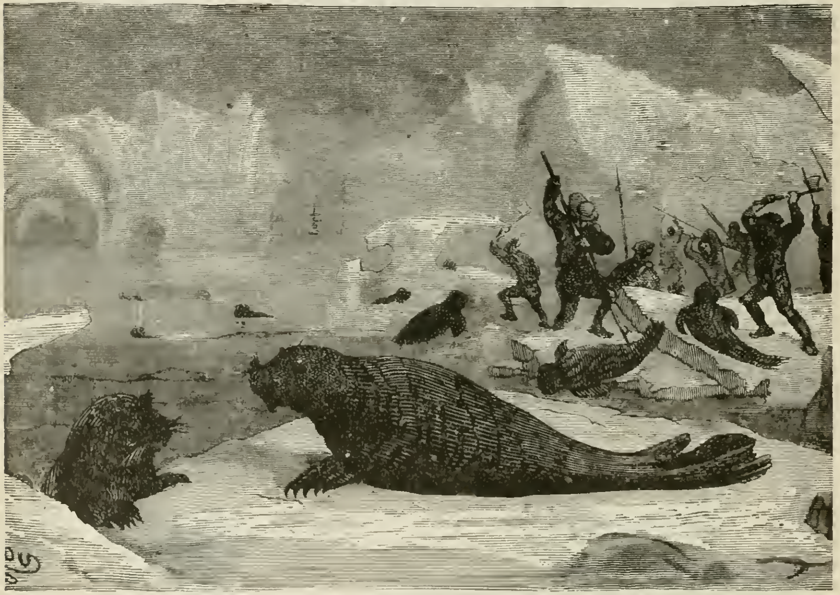
THE CALIFORNIA GRIZZLY BEAR.

Living in the midst of perpetual ice the white bear naturally dreads heat. Pallas, who observed one that was kept captive at Kranojack, in Siberia, says that it could never remain long in its house. Although the climate there is very inclement, it took a constant delight in rolling in the snow. The white bears in the Jardin des Plantes, in Paris, suffer so much from the heat of summer, that it is impossible to keep them alive for any lengthened period. Cuvier, however, says that one lived there for fifteen years, owing to the care that was taken, both in winter and summer, to refresh it by throwing over its body sixty to eighty pails of water daily.

The white bear never becomes familiar with man. When in a state of captivity it always remains wild and taciturn, and shows itself alike incapable of attachment or domestication.

In our own country the bear was formerly common, and indeed is now in the far west. Beyond the slopes of the Rocky Mountains, and in some part of California, fine specimens are to be met with which are suited to their climate and surroundings.

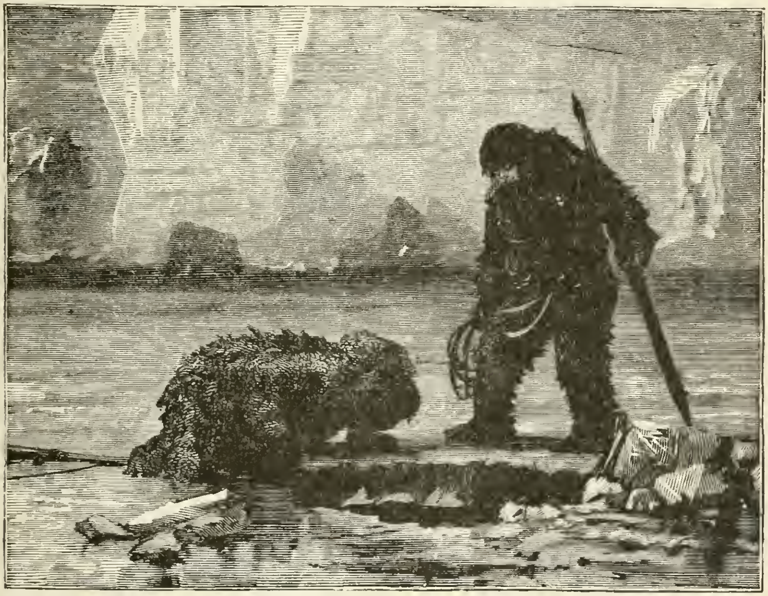
Seals place sentinels to watch during their sleep over the safety of the whole troop. As soon as a man or a band of white bears appear, the sentinels give vent to long-protracted howlings, and the whole company precipitates itself into the sea. These animals mostly breed in caverns which have a seaward face; and the young are remarkably large at birth, and are then clad with a sort of fleece, which is very soon shed —indeed, sometimes even before birth. They follow their dam from the first, and appear to swim and dive with equal facility. The most effectual way of killing seals is to strike them on the nose with a club. If they are attacked with pointed arms they must be speared very deeply to put their lives in danger. When they see themselves surrounded they defend themselves courageously, but with little success. In their fury, if opportunity offers, they break the arms of their enemies between their powerful jaws. They are harpooned from boats, or they are pursued on the icebergs, and killed with axes and pikes, after they have made a most desperate resistance.



A BATTLE WITH BLADDER-NOSES.

All the inhabitants of the shores of the Polar Seas pursue seals, and destroy innumerable quantities of them. They find in these animals precious resources against the rigor and desolation of the hyperborean climate. For the Greenlanders especially the seal is of universal utility. It yields them nearly all they want, and renders life endurable in the cold country which they inhabit. The Greenlander eats the flesh of the seal; and is contented with it, although it is tough and has a disagreeable smell. He drinks its oil, or lights his hut with it. With its skin he makes clothes, wrappers, tents, and canoes; or else cuts it up into straps and thongs. Its muscles and tendons are converted into thread for sewing, and into strings for bows. Its blood even, mixed with other substances, forms a sort of soup. Everything, even to the membranes in the interior of the body, is turned to account; properly dried, these serve, owing to their transparency, to close the openings which admit a little light into the Greenlander's wretched hovel.

And so the chief occupation, as we may see, of the Greenlanders, is seal hunting. From their youngest days they are trained to this exercise, which is for them a matter of life and death. Sometimes they launch out to sea, in their fragile skin boats, and harpoon their prey when it comes to the surface to breathe; at other times they envelop themselves in seal skins, stretch themselves on the shore, and endeavor to attract some unwary seal by their deceitful similitude to itself. The Esquimaux also take the seal by making a hole in the ice, and the moment one of these animals presents itself to breathe the air at the improvised skylight, they seize it.


ESQUIMAUX WATCHING FOR A SEAL.

The Americans and the English of this country are the principal people who organize seal hunting on a large scale. They fit out annually many ships, of from two hundred and fifty to three hundred tons each, for this purpose. The main object of these expeditions is to obtain the oil with which the flesh of these aquatic animals is saturated, and the fur which is one of the great articles of trade.

For a very small profit the peasants on the coast and in the isles of the Baltic brave every year the greatest dangers in pursuit of the seal. When the ice is breaking up, five, six, or sometimes fewer, embark in a canoe, with a supply of provisions and weapons. They run the risk of seeing their boat crushed between the masses of ice, or of being carried away on an iceberg, on which they will probably die of cold and hunger. A good many Norwegians perish each year on these dangerous expeditions. Seals sometimes visit the shores of the north coast of Scotland, and are occasionally hunted in a strange manner, which is not without its dangers to those engaged in this pursuit.

A SEAL MIGHT BE A PET OF THE HOUSEHOLD.

The seal is endowed with so many remarkable faculties that it seems quite suited to become one of our domestic animals; and so it is perhaps surprising that man has not yet thought of training it to fish for him, as he has done with the otter. Its gentleness, its sociability, and, above all, its intelligence, which is almost equal to that of the dog, would insure it a high place in the affections of our race. There are numerous examples on record of seals which, having been tamed when very young, became so much attached to their masters as to follow them wherever they went, and returned to them even after they had purposely been left far from home. They give very little trouble: a basin filled with water in which they can bathe, and a hut with some straw in it on which they may repose, are sufficient to keep them in a good state of health. They must be fed on fish. As they devour an enormous quantity of this food, the cost of keeping them is the greatest obstacle to their ever being domesticated. It is strange, that when they are accustomed to one sort of fish they will not eat any other, and rather die of hunger than consent to change their diet.

The sense of hearing in these animals is very acute. Captain Thomas Brown makes the following remarks on this subject: These animals have a very delicate sense of hearing, and are said to be much delighted with music. The fact was not unknown to the ancient poets, and is thus alluded to by Sir Walter Scott—

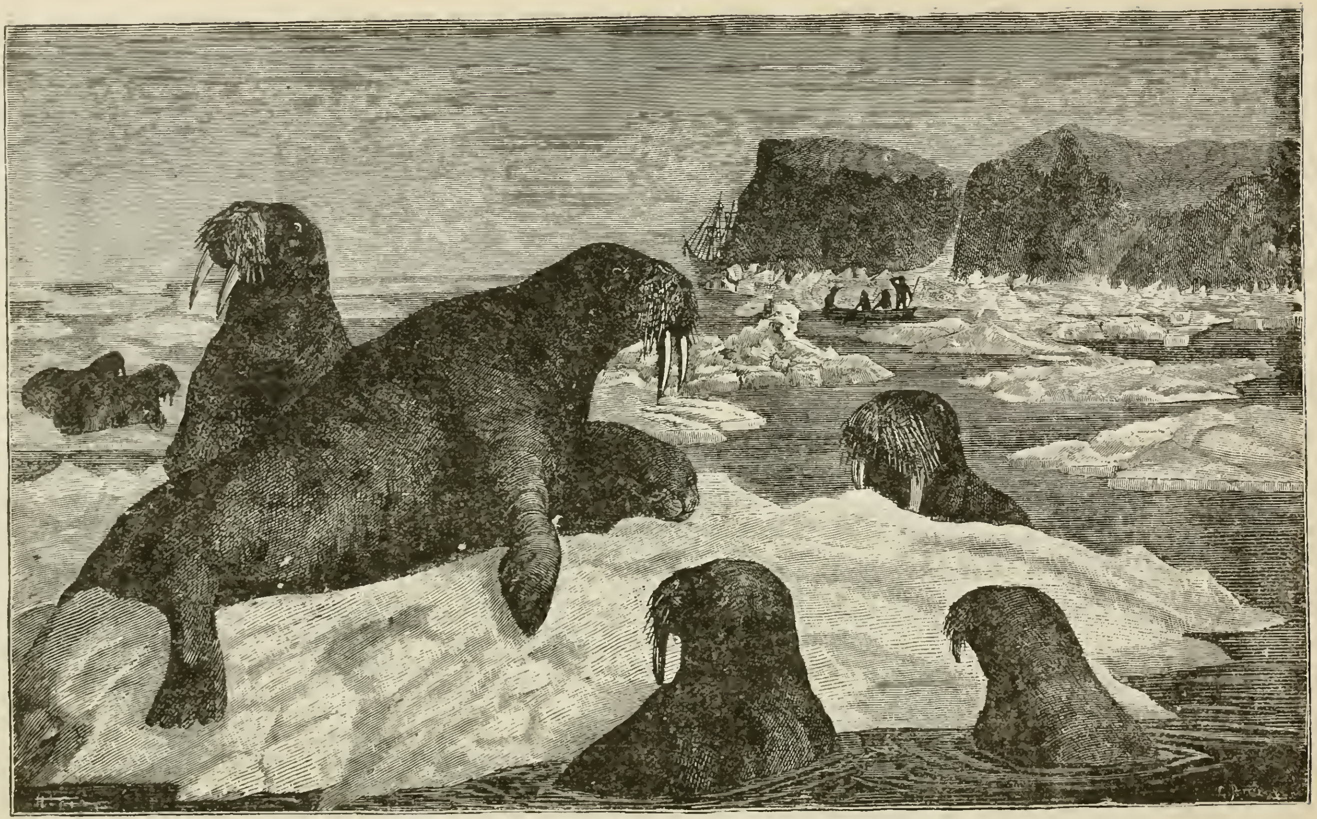
> Rude Heiskar's seals through surges dark
> Will long pursue the minstrel's bark.

Mr. John Laing, in his account of a voyage to Spitzbergen, mentions that the son of the master of the vessel in which he sailed, who was fond of playing on the violin, never failed to have a numerous auditory when in the seas frequented by seals; and Mr. Laing has seen them follow the ship for miles when any person was playing on deck. It is a common practice in Cornwall, when persons are in pursuit of seals, as soon as the animal has elevated its head above water, to halloo to it till they can approach within gunshot, as they will listen to the sound for several minutes. I have seen this method pursued by the fishermen at New Haven, who are very skillful in taking this animal.

A WONDERFUL AMPHIBIOUS ANIMAL.

The walrus and the various seals, of which this order is composed, present a series of characteristics which correspond exactly with the mode of life which has devolved upon them. They have the body elongated, cylindrical, representing that of a fish. Their limbs are very short, the extremities alone being visible; these are converted into fins by being provided with broad connecting webs. Their anterior extremities hang alongside the body, and act backwards and forwards, as in most aquatic quadrupeds; on the contrary, the posterior extremities, stretched out in a horizontal and parallel direction, are arranged in such a manner as to strike the water obliquely. The walrus is far more unwieldy and awkward than the seal on land, where its movements forcibly remind the spectator of the wrigglings of a gentle or fly-maggot; but it makes considerable use of its hind-legs by bringing them forward and thus taking hold of the ground, whereas those of the seals are more directed backwards.

The walrus is covered with short scanty hair of a dark reddish color; its muzzle is large and puffed out at the upper part, and is terminated in a snout, in which are the nostrils, which are turned upwards. Altogether, it is a creature of a massive and unwieldy appearance. It possesses two powerful canine teeth, which, descending vertically from its upper jaw, project somewhat outwards, and constitute formidable weapons. It inhabits exclusively the Arctic Polar regions: it is especially common in the neighborhood of Spitzbergen, of Nova Zembla and on the coasts of Siberia. It disports itself with ease in the water, feeding on shelled mollusks, which it detaches from the submerged banks by means of its tusks, which act like garden rakes. Its gullet is too small to swallow a fish larger than a herring, and it is now certain that this animal subsists mainly as described. Its long canine teeth are, above all, very useful to it in hoisting itself up on the shores, or over the ice which is in its way; they serve it also as points of support, and assist it to advance, by drawing it along on its front legs. It often mounts upon floating icebergs, on which it will drift about for hours together. Naturally mild and inoffensive, the walrus becomes very bold when it is attacked and wounded. Under such circumstances it will fight with the utmost fury, and will show its desire for vengeance by all its actions. If on land, and consequently incapable of pursuing its enemies, its feeling of helplessness makes it utter furious cries; it tears up the soil with its tusks, and attacks everything it meets with on its way. But to



THE GREAT SEA-HORSE OF THE ARCTIC OCEAN.

avoid being injured by it, after it is wounded, all that is necessary is for the hunters to keep at a respectful distance. In the sea, on the contrary, where it can display all its activity, the walrus is rather to be feared; so much the more so on account of the strict union in which it lives with its fellows, who never fail to come in great numbers to help any of their companions which are threatened with danger. They surround the boat, and try to sink it by running it through with their tusks, or capsize it by bearing with their whole weight upon its sides. Sometimes, indeed, they even try to board boats, much to the disgust of the sailors, who have no wish for such company. If the boats row off, they follow them for a long while, and only stop when they are out of sight.

THE VICTIMS OF A TERRIBLE WARFARE.

The walrus has to struggle, not only against man, but also against the bears which inhabit the same latitudes. Although the white bears are provided with formidable means of attack, they do not always come out of the combat victorious. The deep wounds which they carry away with them after their battles with the walrus sufficiently attest the valor and power of the animals which they wished to make their victims. Formerly the walrus existed in such great quantities in certain parts of the icy Arctic Ocean, and were at the same time so bold, that they allowed themselves to be approached by bands of sailors without attempting to escape; so that prodigious numbers of them could be destroyed without any great difficulty.

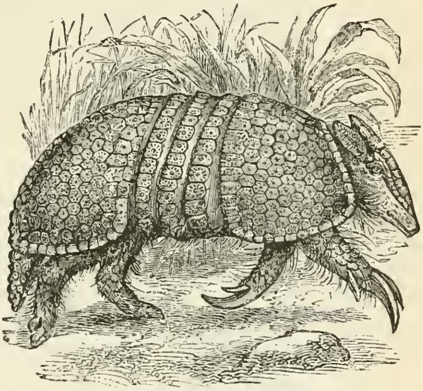
Having learned a lesson from experience, the walruses keep together in bands more or less numerous on the rocks and icebergs; they go but a short distance from the sea, so as to be able to plunge into it on the least alarm; they, like the seal, place sentinels during their sleep, so as not to be taken by surprise. Generally, it is necessary to take to the boats, to row after them, and harpoon them in the water.

Walruses supply diverse products of considerable importance in trade; it is for this reason that such deadly war is waged against them. In the first place their tusks provide us with a grainy ivory, harder and whiter than that of the elephant. These tusks detach themselves when the animal's head has been boiled in a cauldron of water. An oil of a better quality than that of the whale is extracted from their fat; each walrus produces half a ton of it. Lastly, their skins, properly cured and tanned, become very thick and substantial leather, which is employed in carriage-making. In the middle ages, cords and cables, of a solidity which was proof against everything, were made of this leather. Albert le Grand, in the fourteenth century, relates that this skin had a great commercial value in the market of Cologne. The walrus was unknown to the ancients.

A traveler in the East gives us the following interesting sketch of one of his experiences. About eight miles from Kurrachee, in Scinde, is a place well worth inspecting to all who are fond of the monstrous and grotesque. A moderate ride through a sandy and sterile tract, varied with a few patches of jungle, brings one to a grove of tamarind trees, hid in the bosom of which lies the grisly brood of monsters. Little would one ignorant of the locality suspect that under that green wood, in that tiny pool, which an active leaper could half spring across, such hideous denizens are concealed. "Here is the pool," I said to my guide rather contemptuously, "but where are the alligators?" At the same time I was stalking on very boldly, with head erect, and rather inclined to flout the whole affair. A sudden hoarse roar or bark, however, under my very feet, made me execute a pirouette in the air with extraordinary adroitness. I had almost stepped on a young crocodilian imp, about three feet long, whose bite, small as he was, would have been the reverse of pleasant. Presently the genius of the place made his appearance in the shape of a wizard-looking old Fakir, who, on my presenting him with a couple of rupees, produced his wand—in other words, a long pole—and then proceeded to "call up his spirits." On his shouting "Ao! ao!" (come, come) two or three times, the water suddenly became alive with monsters. At least threescore huge alligators, some of fifteen feet in length, made their appearance, and came thronging to the shore. The whole scene reminded me of fairy tales. The solitary wood; the pool with its strange inmates; the Fakir's lonely hut on the hill side; the Fakir himself, tall, swart and gaunt; the robber-looking Belóochee by my side, made up a fantastic picture. Strange, too, the control our showman displayed over his "lions." On his motioning with the pole they stopped, and, on his calling out "Baitho" (sit down), they lay flat

EGG OF THE ALLIGATOR, NATURAL SIZE.

on their stomachs, grinning horrible obedience with their open and expectant jaws. Some large pieces of flesh were thrown to them, to get which they struggled, writhed and fought, and tore the flesh into shreds. I was amused with the respect the smaller ones showed to their overgrown seniors. One fellow, about ten feet long, was walking up to the feeding ground from the water when he caught a glimpse of another much larger just behind him. It was odd to see the frightened look with which he sidled out of the way, evidently expecting to lose half a yard of his tail before he could effect his retreat. At a short distance, perhaps half a mile, from the first pool, I was shown another, in which the water was as warm as one could bear it for complete immersion, yet even here I saw some small alligators. The Fakir told me these brutes were very numerous in the river about fifteen or twenty miles to the west. The monarch of the place, an enormous alligator, to which the Fakir had given the name of "Mor Sahib" (My Lord Mor), never obeyed the call to come out. As I walked round the pool I was shown where he lay, with his head above water, immovable as a log, for which I should have mistaken him but for his small, savage eyes, which glittered so that they seemed to emit sparks. The Fakir said he was very fierce and dangerous, and at least twenty feet in length.


THE BONE-PLATED ARMADILLO.

There is an animal which is met with in South America whose construction is most remarkable. The armadillos are distinguished by the very peculiar nature of their outward integument, which, at first sight, might lead to their being taken for reptiles. Instead of being clad in hair, like other mammals, they have the upper part of the head, the top and sides of the body and the tail protected by a scaly cuirass, very hard in its nature. This cuirass is composed of a number of bony plates, arranged in parallel rows and of various shapes; it is not separate from the skin, but forms a very curious modification of it. On the head, the fore and back part of the body, these plates are firmly fixed to one another; but on the middle of the back they are possessed of a certain amount of mobility, so as to move one over the other. In this way the animal has the power of executing various bending and stretching movements; for instance, of rolling itself up into a ball whenever it is attacked, so as to hide under its cuirass.

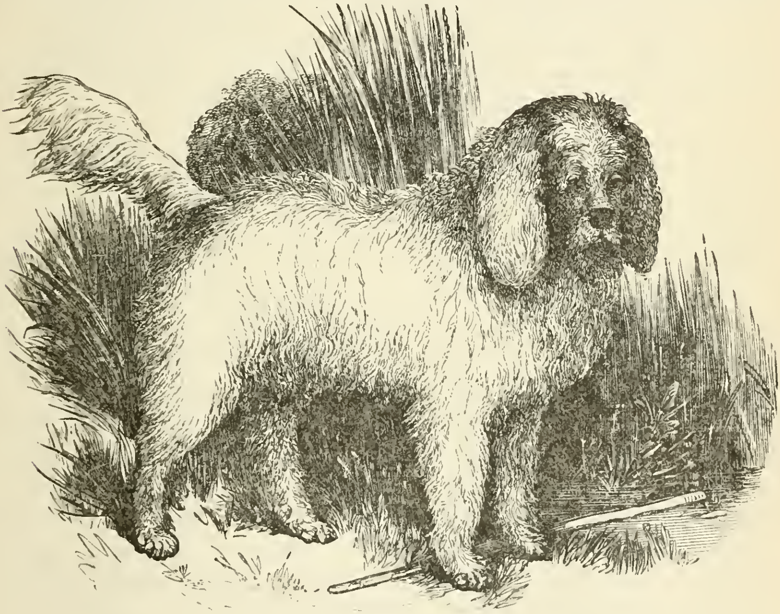
The other characteristics of the armadillos are short legs, provided generally with five toes, terminated by long claws, which are used to scratch up the ground; ears pretty well developed, upright, and pointed; nostrils perforating an elongated snout, and detecting very acutely any odoriferous emanation; a tail either long or rounded, or short and flat. In some species, the number of teeth is considerable: the great armadillo has no less than ninety-eight.

The armadillos are natives of the great plains of South America, where they dig burrows, composed of one chamber, entered by numerous passages. They feed partly on vegetable and partly on animal substance, more especially insects and carrion.

They are inoffensive and harmless in their nature. Their size is generally small; the largest species—that just alluded to, which considerably exceeds all the rest—is not much more than a yard in length. The smallest of the species is about the size of a rat.

Some domestic animals show a remarkable intelligence, and are capable of a high degree of education and training. The late Honorable Alexander H. Stephens had a dog that shared the fame of his master. The name of Rio has become historic. He was Mr. Stephen's companion and pet. The first thing in the morning upon rising and issuing forth, was a jolly frolic with his dog. Rio always slept in the same room with him, and when the master was ill and confined to his bed, the faithful brute was never out of the room save for a few moments at a time, for days and weeks together. He accompanied his master almost everywhere he went. He was as well known on the railroads throughout the State of Georgia as the statesman himself, and we have heard much, gravely told, of the sagacity of this remarkable animal, which would be incredible to readers who did not know him. All that Youatt says of the poodle, as a species, is true of this specimen, and much more. He would close a door quickly and quietly upon being told, or bring a hat, cane or umbrella from another room upon a like command. He not only knew the names of all the household, but actually seemed to understand the subject-matter of conversation. When orders were given by his master to have his trunk brought out to go anywhere, Rio did not need the appearance of the article to manifest his understanding and readiness to go. When left behind, he would go to the depot each day on the arrival of the trains, and if his master did not get out would go through all the cars looking for him. The conductors all knew him, and what he was about; and if, as sometimes happened, he did not get through his search before the cars started, the train was stopped for him to get out. When the master happened to return by any other conveyance, a servant had only to say, "Rio, Mas' Alex's come!" and the dog bounded off with all possible speed to welcome and literally embrace him. His joy was manifested not only by putting his great paws on his breast, but by loud and protracted barking. Return from an absence was always announced to the village by the well-understood signal of Rio's bark.

This dog's intelligence was scarcely more surprising than that sometimes found among other domestic animals. It is on record that a shoemaker in one of our large towns chanced to leave the door of a lark's cage open, of which the bird took advantage to fly away. About an hour afterwards, a cat belonging to the same person, made its appearance with the lark in its mouth, which it held by the wings over the back in such a manner that the bird had not received the least injury. After dropping the bird on the floor, the cat mewed and looked up to her master as if expecting his recognition of her cleverness. Many instances of a remarkable instinct in cats are narrated. One of these animals every day knocks at the door of one apartment in the house, sometimes modestly, sometimes with a sharp double knock, occasionally with a series of raps, pianissimo, like a lady or a quiet, single gentleman. The door is half glass and the knocker low. The cat was not taught, but acquired the trick by his own observation.



THE CELEBRATED RIO.

Some very low orders of life are a surprise to the naturalist, and his astonishment only increases the farther he pursues his investigations. The virulence of the poison of the rattlesnake, for instance, is well known. Doctor Burnett, of the Boston Society of Natural History, states there is good reason for belief that the action of this poison is the same upon all living things, vegetables as well as animals. It is even just as fatal to the snake itself, as to other animals; for another naturalist states that one of his specimens, after being irritated and annoyed in its cage, in moving suddenly, accidentally struck one of its fangs into its own body, when it soon rolled over and died. Here, then, we have the remarkable, and perhaps unique physiological fact, of a liquid secreted directly from the blood, which proves deadly when introduced into the very source (the blood) from which it was derived.

LEECHES ATTACKING TRAVELERS.

Of all the plagues detested by travelers, the land leeches of Ceylon are the worst. They exist in thousands, and though not visible when the weather is hot and dry, a smart shower brings them out of their lurking-places, and they lie in wait for the first passer-by with all the cunning of brigands. Sir Emerson Tennant describes them as being about an inch in length, and as fine as a common knitting-needle; yet they are capable of distension till they equal a quill in thickness, and attain a length of nearly two inches. They have the power of planting one extremity on the earth, as if it were held down by a sucker, while the head is raised to watch for their victims. On descrying their prey, they advance by semicircular strides. Fixing their mouths on the ground, they move forward their tails, and so proceed mouth and tail alternately with the greatest rapidity until they lay hold of the traveler's foot, and ascend his dress in search of an aperture by which to enter. They are so flexible that they can insinuate themselves through the meshes of the finest stocking, and when they once reach the skin they ascend even to the back and throat, and fasten on the tenderest parts of the body. In these encounters the individuals in the rear of a party of travelers are sure to fare worst, as the leeches, once warned of their victims' approach, congregate with wonderful celerity. Their size is so insignificant, and the wound they make so skilfully punctured, that both are generally imperceptible; and the first intimation of their onslaught is the trickling of the blood, or the chill feeling caused by the leech when it begins to hang heavily on the skin from being distended by its repast. Horses are driven wild by them, and stamp the ground with fury to shake them from their fetlocks, to which they hang in bloody tassels. Sir Emerson declares that he has also seen them hang like bunches of grapes round the ankles of palanquin bearers and coolies, who, however, suffer no other inconvenience than the annoyance caused by the inflammation and itching of the wounds. The best cure is to rub the part with lemon-juice. These creatures are not confined to Ceylon, but are known also in the lower ranges of the Himalayas. The Ceylon species have five pairs of eyes, and their bodies are formed of one hundred rings. Their teeth are very beautiful, and amount to seventy or eighty in each set.

There are also in Ceylon spiders, with legs which would span an ordinary-sized breakfast-plate; and it seems to be now pretty well ascertained that these creatures seize small birds and feast upon their blood. There are also such spiders known in Australia and Hindostan. Their webs are strong enough to entangle and hold the small birds; and one species weaves threads, or rather cords, athwart the pathways, which once actually lifted a traveler's hat off his head in riding. Small house-lizards are sometimes seized and devoured by these spiders.

Other tropical wonders are to be found. Mr. Darwin thus describes a crab which makes its diet of cocoa-nuts, and which he found on Keeling Island, in the South Seas. It is very common on all parts of this dry land, and grows to a monstrous size. It has a front pair of legs, terminated by strong and heavy pincers, and the least pair by others which are narrow and weak. It would at first be thought quite impossible for a crab to open a strong cocoa-nut covered with the husk; but a good authority assures me he has repeatedly seen the operation effected. The crab begins by tearing the husk, fibre by fibre, and always from that end under which the three eye-holes are situated. When this is completed the crab commences hammering with its heavy claws on one of these eye-holes, till an opening is made; then turning round its body by the aid of its posterior and narrow pair of pincers, it extracts the white albuminous substance. I think this is as curious a case of instinct as ever I heard of, and likewise of adaptation in structure between two objects apparently so remote from each other in the scheme of nature as a crab and a cocoa-nut.

Other actions of animals are wonderful, as, for instance, when wolves cross a river, they follow one another directly in a line, the second holding the tail of the first in its mouth, the third that of the second and so of the rest. This figure was chosen by the Greeks to denote the year composed of twelve months following one another, which they denominated Lycabus, that is, the march of the wolves.

CHAPTER XVIII.

WONDERFUL BIRDS.

Enormous Birds of Ancient Time—The Condor—The Famous Dodo—Eagle and Fish-Hawk—Rooks Holding a Convention—Wonderful Bird of Paradise—The Humming Bird—The Curious Moth—A Bird that Rings a Bell—Ingenious Nests—The Flamingo—The Frigate Bird—Mysterious Butter Bird—The Hornbill—The King Penguin—Talking Birds—Parrots—The Handsome Hoopoe—The Cuckoo—The Pretty Fly-Catcher—The High-Flying Kite—The Lanner Falcon—The Java Bat—The Bittern—The Thrush—Nests that are Eaten—Turtle Dove—Ring Dove—The Marvelous Cockatoo—Interesting Lessons from Bird Life.

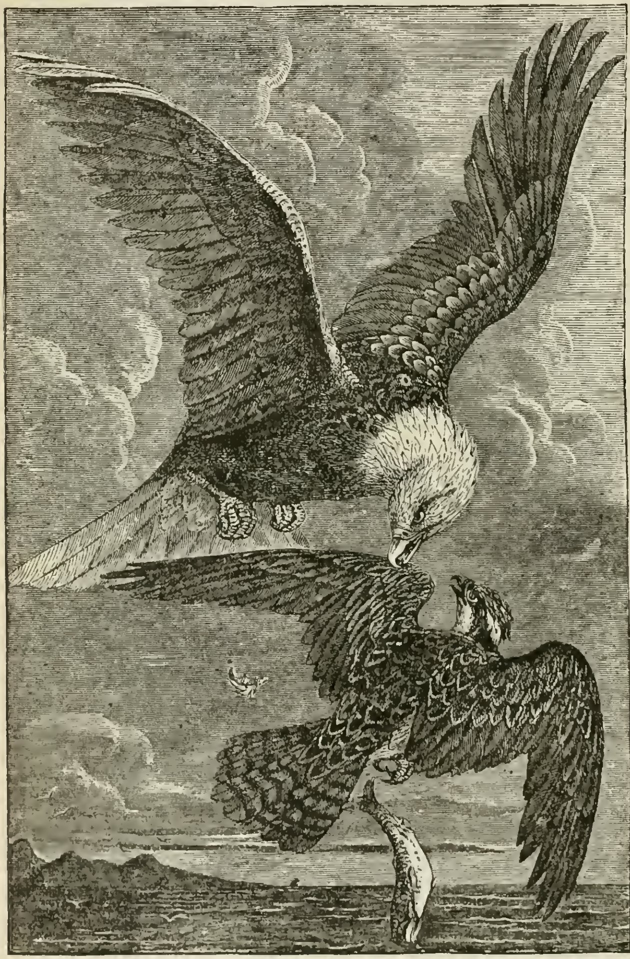
SEVERAL years since some bones of a huge bird were found in the islands of Madagascar and New Zealand, and they were supposed to belong to extinct birds which were very much the same in shape; but lately some of the remains of the epiornis of Madagascar (named from the Greek for tall bird), have been studied by an anatomist, who asserts that they belonged to a gigantic bird of prey, like the condor of the Andes, or the eagle of the mountains of our own country. The great bird was at least ten feet high, and its eggs, many of which were found with the bones, are fourteen inches long. A bird of prey, with its leg bones longer and thicker than the corresponding bones of the largest man that ever lived, and which had eggs six times the size of those of the ostrich, and one hundred and forty-eight times the size of those of the common fowl, must have been at least many times larger than the greatest condor. If the condor and the eagle can carry off a goat or a lamb, what might not the epiornis have pounced upon and removed? The condor has a great length of wing, and swoops down from eight thousand to ten thousand feet with great velocity, and when it is attacked will give much trouble to a single man. The epiornis, with his height of ten feet, would have measured thirty-seven feet from the tip of one wing to that of the other. If this new idea of the habits of the epiornis is correct, the bird may certainly have carried off ten times the weight that a condor could lift.

It is very probable, when the nature of the soil in which the bones of the epiornis have been found is considered with a view to calculate the lapse of time since it was deposited, that there is some reason to believe that the first men who emigrated to Madagascar destroyed the great bird. It is therefore probable that the great epiornis was the roc of Indian story, and that as years progressed the truth was lost sight of in the desire for the marvelous. The size of the bird cannot be doubted.

There are some doubts whether the epiornis was not like a huge bird whose remains are often found in the caves and bogs of the islands of New Zealand. This bird was something like a gigantic ostrich or cassowary. It had bones more like those of a beast than a bird, as regards their length and strength ; and one kind had what is called the drumstick bone of the leg at least three feet in length, whilst another had a foot which covered as much space as the sole of an elephant. The bones of this great foot were as large as the toe-bones of an elephant, and the whole bird must have been about ten feet in height. It had no wings, but a long neck and a small head. The tail was short, and the legs enormously long. The feathers were very hair-like, and there was no power of flight. The bird could stalk along like a fowl, could stride over many yards, and was able to run and jump at a great pace. The huge toes were admirably suited for scraping and grubbing up the tough roots and other vegetable substances which were the food of the bird. The dinornis, as the bird was called (from the Greek for awful or huge bird), was not a bird of prey, but a shy and fleet creature, whose strength of leg was enormous. Overtopping the tallest men, and having a long, erect neck and a proud-looking head, this bird must have astonished the earliest native settlers of New Zealand who have left many stories concerning the gigantic moa, as they called the dinornis.

The dodo is one of the curiosities of natural history, on account of the entire extinction of the bird, and the paucity of its remains. Till a short time ago, nothing but a few fragments of its bones, and those scattered through several museums, were known to exist. In 1866, however, a collection of bones was discovered in the island of Mauritius. These comprised no fewer than a hundred bones and fragments, which had apparently belonged to four or five dodoes, somewhat differing from each other in size. The dodo was undoubtedly a pigeon, but it was flightless, and its structure was modified in conformity with this circumstance. It was somewhat larger than a turkey-cock, and the above discoveries completely authenticate the well-known portrait of the dodo. It was addicted, in some measure, to animal food, and it was doubtless this fact that made its flesh less palatable to the Dutch settlers of the sixteenth and seventeenth centuries, than they found that of the pigeon. A specimen of the dodo was exhibited in a show, and the keeper used to point out a heap of pebbles, some of which were as large as nutmegs, and which, he said, the creature ate.

There is a fierce bird of prey called the fish-hawk, the proper name of which is the asprey. He pounces on the fish, as the rest of the sea-birds do. First he wheels round, then he poises himself in the air, and then he drops, swift as an arrow. In a few seconds he appears again, the water dripping from his plumage. He carries a fish in his mouth, which is still alive and struggling. But none of these birds seem sure of their prey, even when they have snatched it from the waves.


THE WONDERFUL SEA-EAGLE ATTACKING A FISH-HAWK.

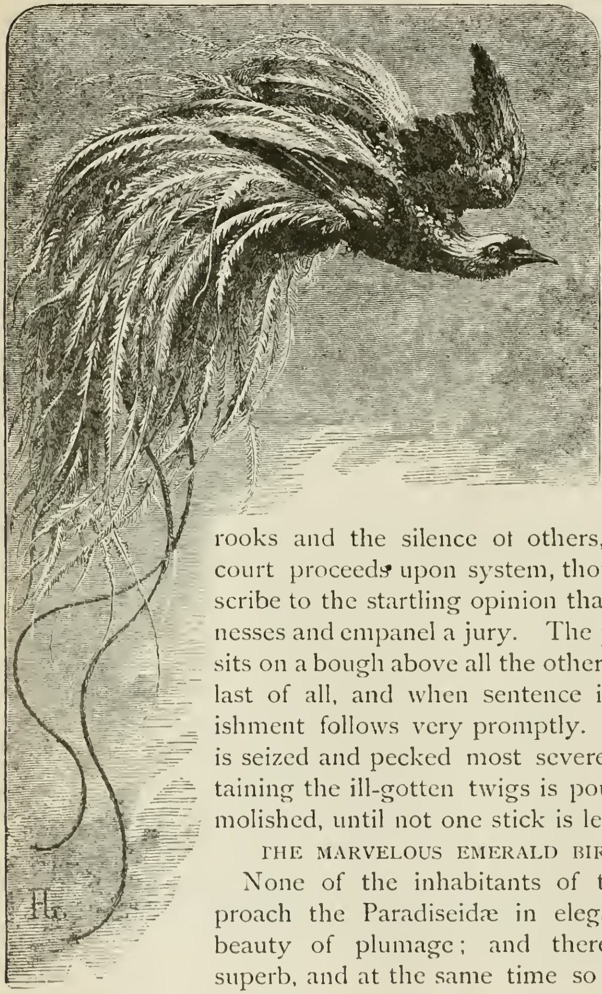
It often happens that the great sea-eagle is close at hand. The eagle loves the lonely shore, and the steep, wild rocks. He has been perched on some tree or crag watching the fish-hawk. Now the time has come for action. He stretches his wings, bends his white head, and swoops like a thunder-bolt on the fish-hawk, which, in his fright, drops his prey, which is snatched up in a moment, and carried off by the eagle in his talons. The sea-eagle lives chiefly on fish, and has his nest by the sea. He drops with such violence on his prey that the Italians compare it to the falling of a piece of lead. They call him the leaden eagle, and he is dreaded by the people who live near the coast. He will carry off lambs from the flock, and all the smaller animals he can get; and he will even attack the cattle. No one who has not seen the manner of attack would believe it possible. First, the eagle dashes into the sea and wets his plumage; next, he rolls himself on the beach until he is covered with sand. After that, he rises up into the air and hovers over an unfortunate ox. The ox goes on quietly feeding, until, all at once, a shower of sand comes into his eyes. The eagle has flung the sand, and now he begins to clap his wings and fling more sand, and startle and terrify the ox as much as he can. He even strikes it with blows from his great strong pinions. The ox is half-blinded, and so frightened that it almost loses its senses. It runs headlong hither and thither, until at length it either drops down from fatigue, or rushes over the cliff, and being dashed to pieces, becomes an easy prey to his enemy. Now and then the eagle meets with his match, for instance when he attacks the dolphin. The dolphin is a sea-animal, a little like a whale, only not so large. The claws of the eagle are entangled in the skin of the fish. He cannot get them free, and as the dolphin dives to the bottom of the sea, it carries the eagle with it.

A very different bird from the pugnacious, ravenous eagle is the harmless pigeon, beautiful in appearance, and far more capable of being domesticated than the wild bird of the forest and mountain.

A vast army of pigeons makes its home in the forests of our country. If you went into the forest where they live, you would find the trees beaten and broken. Great branches lie strewed on the ground. And the ground is as much trampled down, as if an army of soldiers had been there. The pigeons have done all the mischief. When they have eaten up all the nuts and acorns, and every bit of fruit they can find, and have destroyed as much as they have eaten, they go to another place. The whole army of pigeons rises into the air with a rushing noise like thunder. They fly so high that nobody can shoot them.

Accounts are given of a very remarkable flight of these birds in one of our Western States, which lasted several days. It was a wonderful sight. The air was full of pigeons. On they swept—and on—and on. There seemed no end to them. Their wings shone and glistened in the sun; and looked now green, now purple, and kept changing color every minute. For three days this army of pigeons kept flying past. It was a mile in breadth; and it was two hundred and forty miles long! The rushing noise made by the wings of the pigeons was so great, that horses on the road took fright, and people could hardly hear themselves speak. This strange flight is a matter of history.

Another bird, the rook, has very singular habits and characteristics. Rooks, like men, have not all the same nice sense of justice. Some of them are honest, obliging and industrious, others knavish, idle and mischievous. In the spring months in particular, when they are all busy building nests, or repairing old ones, certain evil-doers invade their neighbors' store of sticks to save themselves the trouble of collecting materials in a more laborious and lawful way. This, to some, may appear a very venial crime, but what a plank is to a carpenter a twig is to a crow, and to pilfer the one is as bad as to purloin the other. But as often as offences of this kind are detected, a complaint is made to the proper quarter, and the delinquent tried and punished by his peers. Some veteran bird acts as chief justice, and from the bustle that goes forward, the cawing of some rooks and the silence of others, it is plain that the court proceeds upon system, though we cannot subscribe to the startling opinion that they examine witnesses and empanel a jury. The presiding rook, who sits on a bough above all the others, is heard croaking last of all, and when sentence is pronounced punishment follows very promptly. Either the culprit is seized and pecked most severely, or the nest containing the ill-gotten twigs is pounced upon and demolished, until not one stick is left upon another.



THE MARVELOUS EMERALD BIRD OF PARADISE.

None of the inhabitants of the bird world approach the Paradiseidæ in elegance of shape and beauty of plumage; and there is something so superb, and at the same time so unearthly, in their appearance, that it is hardly to be wondered at if the fancy of the early voyagers supposed them to be fit denizens of the Garden of Eden. The most extraordinary legends at one time prevailed about them. It was said that they lived wholly upon dew, and passed their lives in long aerial voyages; that they so spurned the earth as never to touch it until the moment of death approached; that they never rested except when suspending themselves from the branches of trees by the shafts of their two tail-feathers; and it is still a belief of the Malays that for raising their young they retire to the untroubled groves of Paradise. These fables partly arose in their peculiar habits, and partly in the Papuan custom of tearing off their legs before sending them to market, which led the European navigators to suppose that they were all wings and body. Then, again, owing to the singular looseness of their plumage, they always fly against the wind. Add to this, that they dwell in the recesses of the vast virgin forests, afar from the haunts of men, and that their song or cry is very characteristic, and it is not difficult to understand how they came to be invested with so many fabulous attributes, and made the subjects of so many romantic stories.

The Paradiseidæ are confined exclusively to the Australo-Malay Islands—having probably their true habitat in Papua or New Guinea. In the tropical forests of these islands they live in large troops; and as they fly on undulating wing, or perch on the summit of the tallest trees, they lend an additional beauty to the landscape by the rare splendor of their many-colored plumage. They shun the noontide heat, and seek their food, which consists principally of fruit, in the morning and evening. They show a great partiality for the fruit of the fig and teak trees, but do not disdain an occasional meal of insects, of which, however, they reject the horny or scaly case, legs and wings. They are polygamous; that is, the male has several mates, from whom he is easily distinguished by the superior bravery of his appearance. Moreover, they recognize a form of government; a flock of forty or fifty birds flying always under the direction of a single bird, which the Papuans call their chief. Their cries are very peculiar, and seem to differ according to the meaning they are intended to convey; their congratulatory note, on meeting one another, resembles the cawing of a raven, but is more diversified in its gradation, and may be expressed as "he, he, ho, haw," frequently repeated and rapidly. Sometimes they appear to issue a call or summons, the notes resembling the syllables "whock, whock, whock," uttered in a kind of barking tone, and so loudly as to be audible at a considerable distance

The best-known species is the emerald bird of paradise, of which it has been said that it possesses plumage which in one part glitters with all the dazzling, gem-like hues of the humming-bird, in another is soft, warm, and delicately tinted, and in another is dyed with a rich intensity of coloring that needs a strong light to bring out its depth of tone; and yet the torrent of graceful and softly-tinted plumes that flow with such luxuriant redundance of changeful curves over the body, are in themselves sufficient to place the emerald bird of paradise in the first rank of beauty. It is the queen of all wonders found with wings.

It has been asserted of this glorious creature, that it surpasses in beauty the whole of the feathered creation. This is a bold eulogium, but we are not disposed to quarrel with it; nor will the reader, if he succeeds in realizing to himself what manner of bird it applies to:—a throat of the brightest emerald; a canary-tinted neck shading its color gradually into the fine chocolate of the other parts of the body; wings of a warm reddish-brown, like the leaf of the chestnut in autumn, from which droops, as it were, a cloud of loose, golden plumes, in graceful, feathery tufts. The chocolate-colored tail is short, but projecting from it are two very long shafts of the same hue, longer even than the silken plumes of the sides. Surely, the fairy creature which is clothed in plumage of this bright and varied character must be "a thing of beauty" and "a joy for ever!" It would be worth a voyage to see it fluttering through its leafy forest-haunts, and streaming its brilliant plumes against the wind! In color it is nothing less than a flying rainbow.

THE BEAUTIFUL HUMMING-BIRD.

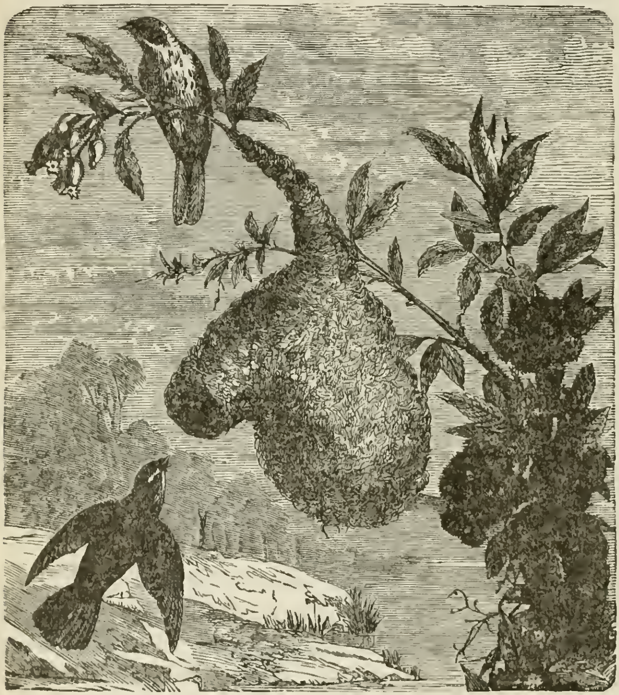
Under the shade of a tree, at the end of one of the twigs, hangs a tiny little nest. It hangs in the air, and is as light as a feather. It is made of moss, and down, and whatever the bird could find. It is very snug, and two eggs the size of peas, and as white as snow, lie within it. Flowers scent the air, and yonder is a deep wood. The bird is about the tiniest creature you ever saw. Its body is no bigger than a walnut, but its feathers are more lovely than can be described. It has a green crest, on its head, which sparkles like a little star. The colors on its body are green, and gold, and purple. You can scarcely tell where one ends, and another begins. Humming-birds live in many places where it is hot. They are found in India, and in our own country. The woods and groves are alive with them. They flash about here, and there, clad in the fairest, brightest colors The eye is never tired of watching them.

The humming-bird will finish her dinner with a sip of honey, but she also wants something more substantial. There are a great many insects hidden at the bottom of the flowers. She spies them out, with that bright eye of hers. Then she darts her long tongue into the middle of them. An insect sticks to it, for the tongue is sticky, as if it had been rubbed with glue. The insect is drawn into her mouth; she swallows it, and then darts out her tongue for another. All this time, she is hovering over the flower, and humming with her wings. When she has had enough insects, she sips a little honey, and flies back to her nest.

There is a singular, winged little creature to be met with in South America, which is quite as wonderful as the bird just described, and, in fact, much like it. A traveler has thus referred to it: A little girl of our party came running to me, and with face all aglow, said, "I have not shown you my humming-bird yet. I keep it in a cage in the house for fear the others should get at it; but it takes a flight by itself every day, and comes back again when it wants a sip of sirrup, or wishes to go to roost. I must show you some nests of the beautiful little birds which they have built not far off." I accompanied her to a little distance, where, hanging to some long, pendant leaves, she pointed out two little purse-shaped nests, composed, apparently, of some cottony material bound together with spider-web. A graceful little bird was sitting in each of them, with tails having long, pointed feathers. The upper part of their bodies were of a green bronze, except the tail-coverts, which were of a somewhat rusty red; while the tails themselves were of a bronzed tint, broadly tipped with white. While we were looking, the mate of one of the birds came up and perched close above the nest. As we were going away I saw two others pass by us, of the same size, it seemed to me. Another settled on a flower near at hand, when the idea seized me that I could catch it. I struck it with my hat, and down it fell. Stooping down, what was my surprise to find, instead of a humming-bird, a moth so exactly in shape and appearance like the humming-birds, that it was no wonder I had been deceived. The moth, however, though stunned, was not killed. On taking it to the hut I compared it with her tame pet, and was struck by the remarkable similarity in the shape of the head and position of the eye. The extended proboscis represented the long beak of the bird, while at the end of the moth's body was a brush of long hairs, which, as it flew along, being expanded, looked very much like the feathers of the bird's tail. The resemblance, of course, is merely superficial, their internal construction being totally different.

THE WONDERFUL BELL-BIRD.

Continuing our journey as we were paddling on, we were almost startled by hearing a sound like a bell tolling in the midst of the forest. It ceased, and we paddled on, when again it struck our ears loud and clear. Again it came within the space of a minute, and we almost expected to see some church steeple peeping forth through an opening in the primeval forest. We tried to ascertain from our young Indian companion what it could mean, but he only nodded his head, as much as to say, "I know all about it," and then he gave a glance down at his bow and quiver which lay by his side. We went on for some minutes more, the sound of the bell reaching our ears as before, and then began to look up eagerly into the trees. Suddenly we saw, on the topmost bough of a tree overhanging the water, a beautiful white bird, about the size of a jay. At the same time there came forth from where it stood a clear bell sound, and we saw from its head a black tube, rising up several inches above it. Our Indian boy cautiously put his hand out and seized his bow. In an instant he had fitted an arrow to the string. Away it flew, and down fell the bird fluttering in the water. We paddled on, and quickly had it on board. I could not help feeling sorry that he had killed the beautiful creature, whose note had so astonished us. It was, I found, a specimen of the somewhat rare and very wonderful bell-bird. From the upper part of the bill grows a fleshy tubercle about the thickness of a quill, sparingly covered with minute feathers. It was now hanging down on one side, quite lax. It was evident, therefore, that the bird, when alive, elevated it when excited by singing or some other cause; indeed, afterwards, on examining it, we found it connected with the interor of the throat, which further convinced us of this fact, and made it plain beyond question.



NESTS OF THE PENDULINE TITMOUSE.

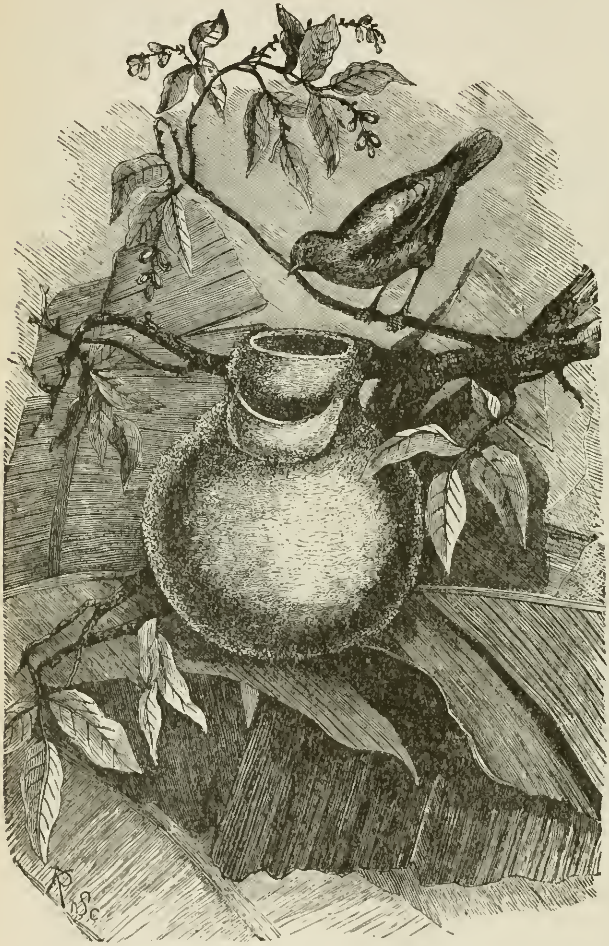
A large volume might easily be written on the wonders of bird's nests. Every different kind of bird has a different kind of nest, and each pair always adhere to the peculiar style of architecture of the particular species to which they belong. So characteristic is the nest, that an experienced collector could, when shown one, immediately name the bird by which it was constructed.

Birds themselves differ so much in form, in size and in their modes of life, that we should expect to find great differences in the requirements of their young; but it would be a hopelessly long task to attempt to give even an outline of the various constructions which are employed. All we shall do will be to mention some of the most curious of these beautiful contrivances, and to point out, wherever possible, the reasons which appear to have guided the little architects in their plan.

There is a little bird found in India, and known by the name of the tailor-bird. On a leaf or two at the extremity of a slender twig is the little cradle made. If one leaf be sufficiently large, the edges are drawn together so as to form a pouch, in which the nest is formed. To preserve the pouch, the parent birds twist vegetable fibre into a fine thread, and by the help of their bills and feet actually bore holes through the edges of the leaf and stitch them together. If one leaf be considered too small, then another growing by, or a dead one, is stitched on to it, so as to form a pouch roomy enough to contain the expected family. The inside is then completed by being carefully lined with down and feathers. This is truly a rocking-cradle, for, hanging from a leaf, it is, of course, moved by every breath of wind; but the little tailor-bird has a formidable enemy, which it is necessary to avoid. Tree-snakes infest the trees in India, and young birds and eggs form their favorite prey. Did the tailor employ his art anywhere but on the finest twigs, the snake would be able to visit his domicile; but by placing his nest in the position he selects, the unwelcome intrusions are completely prevented.

The nests of the pensile weaver-bird are also curiosities. They are always suspended from the twigs of trees overhanging water, and form an object of curiosity to the traveler in Africa. Each consists of a hollow globe, which, when rendered soft and warm by being lined with feathers, constitutes the nest properly so called; but the peculiar feature of this construction is the passage by which the weaver enters his home. There is a tube about a foot or fifteen inches in length, made of the same material as the nest; one end of this tube opens into the chamber, the other goes down to within a few inches of the surface of the water. Into this nest none but a flying creature could enter. It cannot be approached but by the tube, and to the mouth of this tube there is access neither by land nor water, but only through the air. The object of this curious contrivance is doubtless the same fear of snakes which guides the tailor-bird. The instinct of these ingenious creatures shows them how to evade their active and insinuating enemy, who dares not venture out upon the slender twigs from which these nests are suspended. The weaver-birds are so called from the mode in which they make their nests and the tubes which hang from them. These are formed of dried grasses, which are so beautifully interwoven as to form a very compact and strong case. Thus these birds have anticipated man in weaving, as the tailor-birds have in sewing.

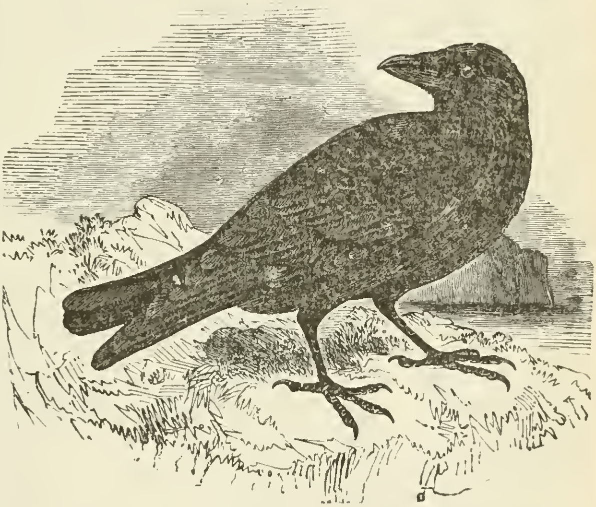
The nests of the sociable grosbeak, a bird found in South Africa, are worthy of notice. It may be described as a colony of nests packed under one roof. Like our common crow and many other birds, the grosbeak is fond of the society of its kind; but, unlike them, it is not satisfied with having its neighbor's nests on adjacent branches of trees; they must all be close together. When a number of these birds agree in forming a habitation, the first thing to be made is the roof. A large and lofty tree is selected, and in the topmost branches of this the birds, numbering perhaps some hundreds, commence their labors. With coarse grass they form the roof, strengthening it by interweaving the fibres; this having been accomplished by the joint efforts of the community, each individual pair constructs its own nest under the shelter thus provided. These are placed side by side, and when the whole are finished the entire under surface is covered with the circular openings leading to each nest. Three or four eggs are laid by each female, and as many as three hundred and twenty nests have been counted under one roof. The feeding and rearing of a thousand young makes a very busy scene.



NESTS OF THE CAPE TITMOUSE.

It is not known what may be the object which is gained by this union of birds into a republic; possibly it may be for mutual protection against some common enemy.

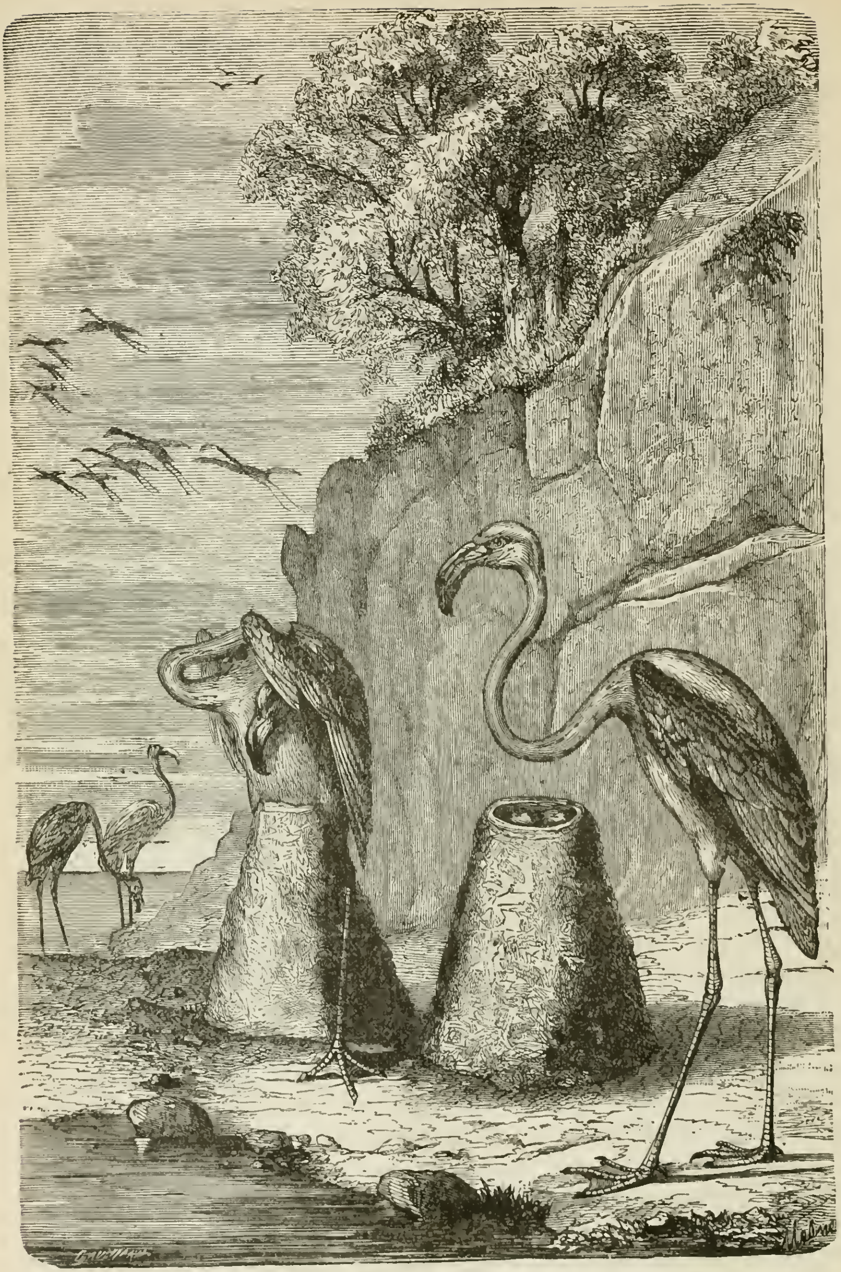
Not merely in nest-building do the feathered tribes show their instinct and sagacity. Mr. Ball, the eminent naturalist, relates the following anecdote of a raven. When he was a boy at school, a tame raven was very attentive in watching their cribs or bird-traps, and when a bird was taken, the raven endeavored to catch it by turning up the crib; but in so doing the bird always escaped, as the raven could not let go the crib in time to seize it. After several vain attempts of this kind, the raven, seeing another bird caught, instead of going at once to the crib, went to another tame raven, and induced it to accompany him, when the one lifted up the crib, and the other bore the poor captive off in triumph.



THE SAGACIOUS CROW.

From the nest of the smallest bird we pass to that of a great bird upwards of five feet high. It is found on the sea-coast of Africa, and is called the flamingo. The plumage of these noble birds is most splendid, being a combination of carnation hues with delicate white. A row of them standing together is a most striking spectacle. The neck is long, but the bill is so strangely shaped that it seems difficult to understand how it is used for procuring food. The nest is curiously constructed, and their mode of sitting upon it is most extraordinary. They scrape together a hillock of earth; then, a hole having been made in the top, two or three eggs, each as large as a goose-egg, are laid. The female sits upon them, with her legs resting at either side on the ground, or sometimes even in shallow water, from which, as a sort of island, the hillock rises.

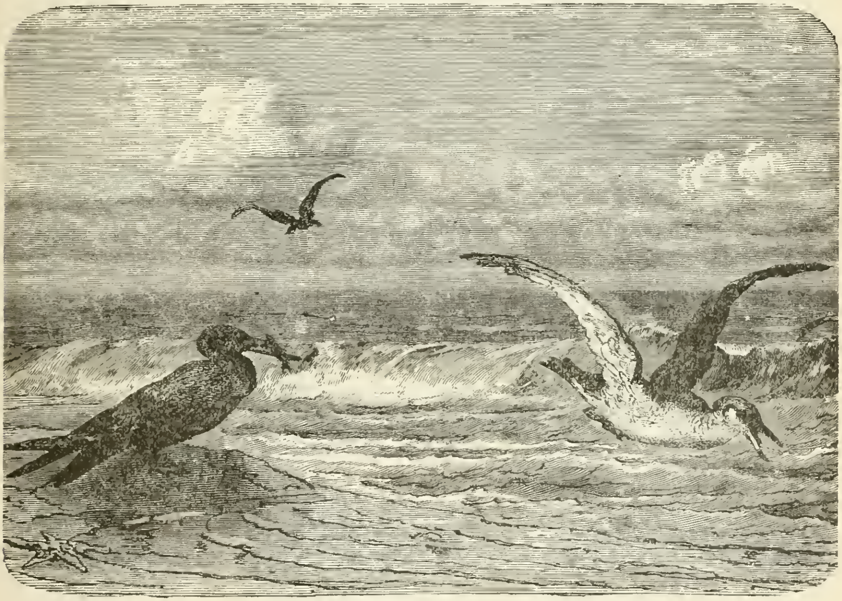
One of the greatest wonders in natural history is the flight of birds. We have been all our lives so accustomed to see birds, that we are not now prone to marvel at the wonders of their flight. We must meditate



THE IMMENSE FLAMINGO AND ITS CURIOUS NEST.

on the beautiful arrangements by which they are enabled to raise themselves in the air and propel themselves through it, and we must remember how utterly futile all man's attempts to fly or make flying-machines have proved, and then we are in a condition to appreciate the marvel which is daily before our eyes.

The frigate-bird is endowed with magnificent powers of flight. His wings stretch to an expanse of about ten or twelve feet; his body is about three feet long; his bill is very powerful, and adapted for seizing. His feet are webbed, but very small; he has but little use for them, his home being in the air, hundreds of leagues away from land, He is seen soaring high above the ocean, but on its bosom he never rests. When he seeks repose he finds it aloft in the air. His foot rarely touches land except at the time for pairing, making nests, and rearing young. How is all this? The expanse of his wing is so vast, and his body is so light, that he can soar with little or no exertion. Still it is difficult to see how this would enable him actually to sleep on the wing, as it is believed he does. A more close examination shows, however, that his bones are hollow, and that there is a large pouch communicating with his lungs and with the cavities in the bones. This pouch he can inflate with air, and thus render himself buoyant; the sustaining power thus acquired, added to that of the wings is sufficient to keep him up.



THE FAR-FLYING FRIGATE-BIRD.

If his home be in the air, if he neither dive into the sea for fish, nor search on the land for other food, whence does he derive his sustenance? Impelled by hunger, he descends from the lofty regions where it is his delight to dwell. Whether the sea be rough or calm, he glides along over the water, and any unwary fish approaching the surface, on being detected by his keen eye, is pounced upon instantaneously and swallowed, his dexterity in fishing being most extraordinary.

But the frigate-bird has other resources; though he cannot dive into the sea to catch fish, he avails himself of the labors of birds which can. He watches one of the birds which dive; he sees him emerge successfully, and fly off with his prey. Instantly the frigate-bird is down upon him with a swoop of terrific velocity. The frightened diver drops his fish in mid-air; the frigate-bird poises himself again, darts down with another swoop, and seizes the fish ere it reaches the water.

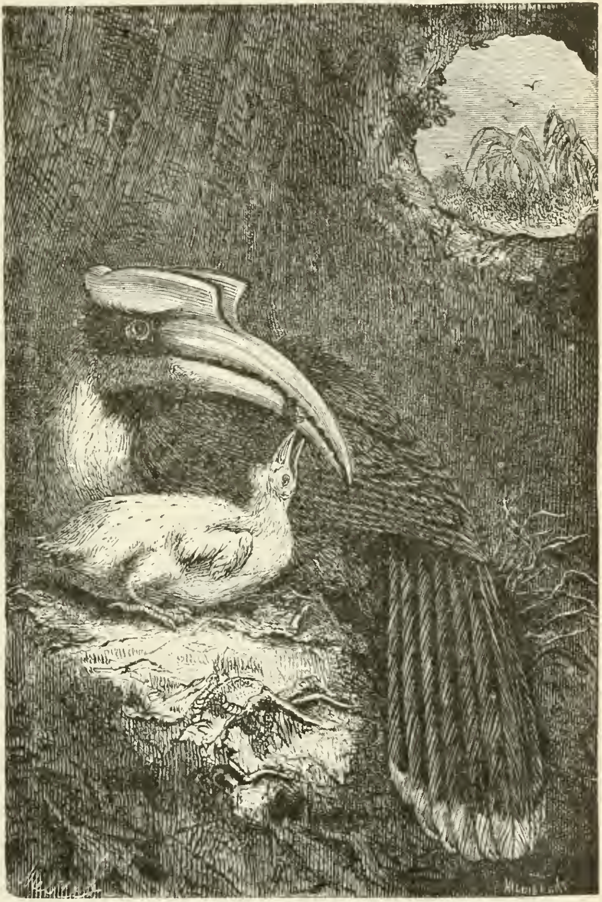
THE MYSTERIOUS BUTTER BIRD.

Humboldt records a visit to Caripe, in South America, where is the cavern of the guacharo bird; and our knowledge of this wonder is derived from his most interesting narrative. Among the natives in the country around, this cavern is celebrated for its great size, for the mysterious birds which haunt its inmost recesses, for the river which flows from it, and for the superstitious belief that in its gloomy depths is the abode of the spirits of their departed ancestors. The name which it bears signifies "the mine of fat," because from the young of the birds which inhabit it an immense quantity of fat is annually obtained. These birds are about the size of our common fowl, with wings which expand to three feet and a half. All day long they dwell in the cavern, and, like our fowls, only come forth at night. They subsist entirely on fruits, and have very powerful beaks, which are necessary to crack the tough nuts and reeds which form part of their food.

The approach to the cavern where they are found is along the bed of a river, in a valley celebrated for its beauty and the salubrity of its climate. The immediate entrance is surrounded by the most gorgeous tropical vegetation. The hill, into the depths of which it penetrates for upwards of half a mile, is clothed with trees of immense height. The mouth is a splendid arch upwards of seventy feet high; the river which flows from it has a fringe of vegetation along its banks, which gradually diminishes as the gloom increases.

The cave is so straight that the traveler can enter for some distance without being obliged to light his torch. As he proceeds over the somewhat rough ground which forms the bed of the river, he begins to hear from afar the hoarse cries of the guacharo birds; and when he has arrived at the dark parts of the cavern the noise is perfectly terrific, thousands of the birds uttering their piercing cries simultaneously.

These screams re-echo from the surrounding walls, and when it is remembered that they take place in pitchy darkness, it will be easy to understand the superstitious terrors which the Indians associate with the spot. At half a mile from the entrance the river forms a cascade, and beyond this the cavern slightly changes in direction. Nothing will persuade the timid Indians to advance further than this lonely spot.



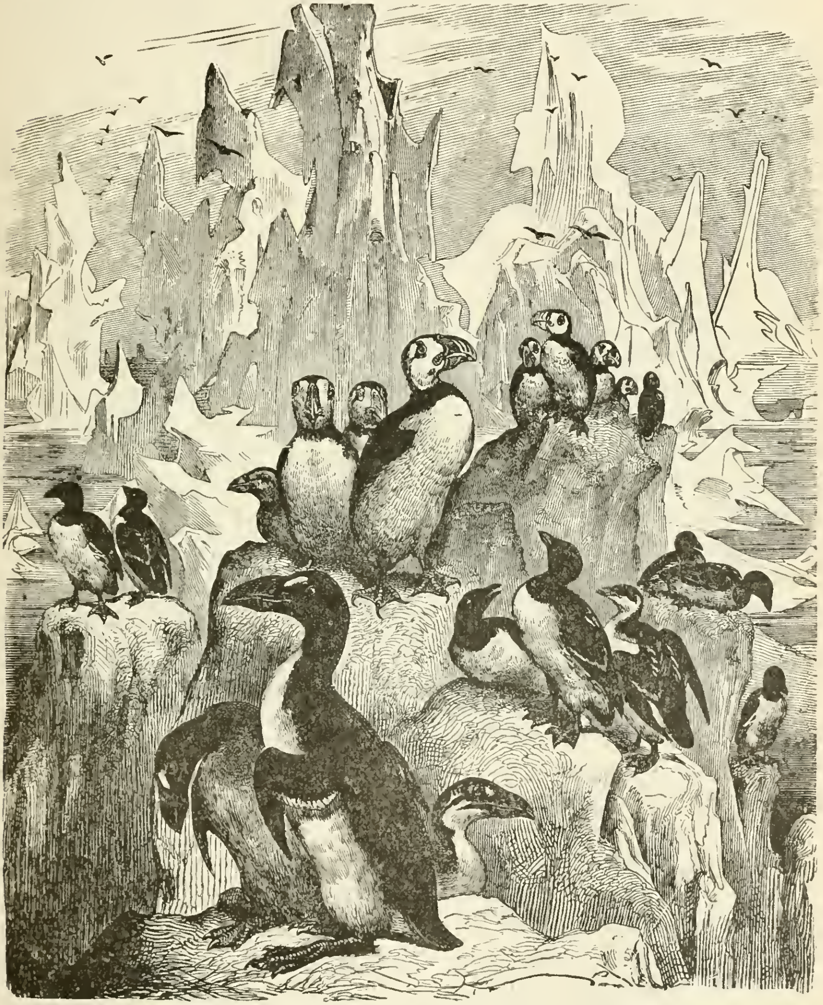
THE HORNBILL FEEDING ITS YOUNG.

Midsummer is the harvest time for the fat. The Indians enter the cave armed with long poles. The nests are attached to holes in the roof about sixty feet above their heads. They break these with the poles, and the young birds fall down and are instantly killed. Underneath their bodies is a layer of fat, which is cut off, and is the object sought. At the mouth of the cavern huts are erected with palm-leaves, and there, in pots of clay, the natives melt the fat which has been collected. This is known as the butter of the guacharo; it is so pure that it may be kept for upwards of a year without becoming rancid. At the convent of Caripe no other oil is ever used in the kitchen of the monks, and no other could answer their purpose so well.

This shows what wonders abound in the bird-world, and what singular instincts and habits the feathered creation exhibits. In the Celebes Islands there is a remarkable bird called the hornbill. It has a curious nest. The female selects the hollow of a tree, and at the proper time retires to it, where she makes a kind of couch of her own feathers, lays her eggs, hatches them and abides with her young until they are fully fledged. The male, meantime, plasters up the entrance to the nest, all except a narrow slit, adapted to the form of his beak, through which he feeds his mate. As a consequence, it is said, the voluntary prisoner grows quite fat, while the poor husband gets so lean and weak that any sudden change of temperature overcomes him. Not all the birds of remarkable construction and habits are confined to warm climates. The cold and desolate regions in the neighborhood of the poles are inhabited by numerous animals which rejoice in the climates of those frozen seas, and flourish under circumstances that would prove fatal to animals less well protected than they are. These animals are nearly all aquatic. The polar bear loves the ice and the icy cold water. His favorite prey, the seal, lives almost exclusively therein. The waters abound with different kinds of fish which make food for the seals, and for thousands of birds whose sole nourishment they are.

One of the most curious of these birds is called the king penguin. He is a most extraordinary creature, not only in appearance, but also in his mode of life. He is upwards of three feet high, and his plumage is short and waterproof. He has no wings, but instead of them small flappers that appear something like arms. His feet are webbed, and placed so far back that when standing he is upright like a man; whereas in ordinary birds the body is more or less horizontal. His flesh is rank and oily, and underneath the skin is a layer of fat, which serves to protect him from the cold.

This bird is found in great numbers in Macquarrie Island in the South Pacific Ocean, and a most interesting account of its habits has been given by a naturalist, who visited the locality. The number which inhabited the spot was enormous, but as thirty or forty thousand were continually landing, and the same number going to sea, it was impossible to arrive at an exact estimate. On shore they were arranged as regularly as a regiment of soldiers, and in as compact a manner; the young birds in one place, the moulting birds in another, the sitting hens in a third, the clean birds in a fourth; and so strictly is the order kept, that if a bird of one class intrude itself into the ranks of another it is instantly ejected. The females hatch the eggs by keeping them close between their thighs, and if approached during the time of incubation, move away carrying the eggs with them. At this time the male bird goes to sea and collects food for the female, which becomes very fat. After the young is hatched, both parents go to sea, and bring home food for it. It soon becomes so fat as scarcely to be able to walk, the old birds getting very thin. They sit quite upright in their roosting places, and walk in the erect position until they arrive at the beach, when they throw themselves on their breasts in order to encounter the very heavy sea met with at their landing place. They lay but one egg, of a whitish color, and twice the size of that of the domestic goose.



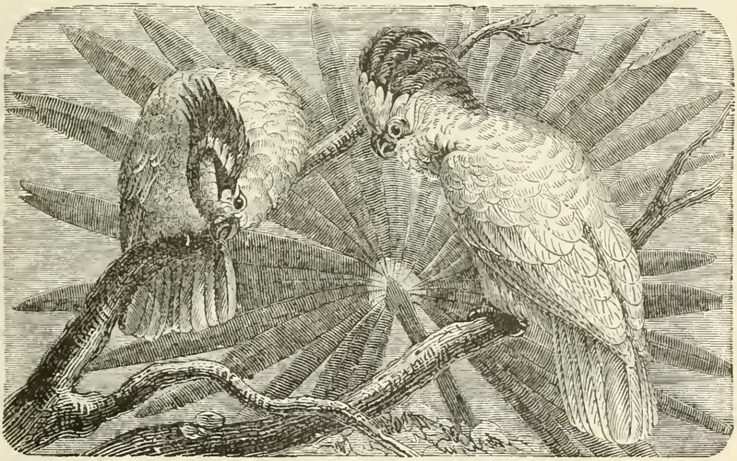
THE WONDERFUL PENGUINS AND OTHER ARCTIC BIRDS.

As the penguin has no wings, he is, of course, unable to fly; and as his movements on land are very awkward, the sea is the display of his powers. In swimming and diving he is unrivalled. Here his abortive wings are of great value to him; they act as fins or paddles which assist his hind feet in propelling him through the water. He sometimes, when coming to the surface after a dive, leaps from the water into the air, and down again like a fish, for which, indeed, in this manœuvre he might easily be mistaken. Fish form his sole food and the food of his young, and his wonderful powers of diving are used in catching them.

Living on islands and in localities uninhabited by man, the penguins have not learned the dread of man which other animals exhibit. Illustrative of this point, Mr. Darwin gives us the following interesting account: One day, having placed myself between a penguin and the water, I was much amused by watching his habits; it was a brave bird, and till reaching the sea, regularly fought and drove me backwards. Nothing less than heavy blows would have stopped him; every inch he gained he firmly kept, standing close before me erect and determined. While thus opposed he continually rolled his head from side to side in a very odd manner. This bird is commonly called the jackass penguin, from its habits, while on shore, of throwing its head backwards and making a loud, strange noise, very like the braying of that animal; but while at sea and undisturbed, its note is very deep and solemn, and is often heard in the night-time. In diving, its little plumeless wings are used as fins, but on the land as front legs; when crawling (it may be said on four legs) through the tossocks or on the side of a grassy cliff, it moved so very quickly, that it might easily have been mistaken for a quadruped. The manner in which the young are fed is very curious. The old bird makes a great noise, between quacking and braying; after having thus chattered for a minute, it puts its head down and opens its mouth widely, into which the young one thrusts its beak and takes the food provided for it.

The variety of strange sounds uttered by various birds has been duly noted by ornithologists and bird-fanciers. Some are more teachable than others, and it is to these specimens that the epithet of "talking" is strictly applicable. The bullfinch learns to whistle tunes, to sing in parts and even pronounce words. We have from an authentic source an account of a talking canary. Its parents had formerly successfully reared many young ones, but three years previously they had hatched only one out of four eggs, which they immediately neglected by commencing the rebuilding of a nest upon the top of it. On this being discovered the unfledged and forsaken bird, all but dead, was taken away and placed in flannel by the fire, when, after much attention, it was restored and then brought up by hand. Thus treated, and away from all other birds, it became familiarised with those persons only who fed it; consequently its first singing notes were of a character totally different to those usual with the canary. Constantly being talked to, the bird, when about three months old, astonished its mistress by repeating the endearing terms used in talking to it, such as "Kissie, kissie," with its significant sounds. This went on, and from time to time, the bird repeated other words, and for hours together, except during the moulting season, it astonished all who heard it by ringing the changes according to its own fancy, and as plainly as any human voice could articulate them, on several words. The usual singing notes of the bird were more of the character of the nightingale, mingled occasionaly with the sound of the dog-whistle used about the house. It whistled also very clearly the first bar of the tune entitled "America," and was evidently capable of high attainments.

Several birds approach the faculty of talking, mimicry and imitation of peculiar sounds. The Chinese starling, in captivity, is very teachable, imitating words, and even whistling tunes. The piping crow is named from its ready mimicry of other birds; and its imitation of the chuckling and cackling of a hen, and the crowing of a cock, is very perfect. The snowy-owl utters hideous cries, which resemble those of a man in deep distress. The natural cry of the Virginia eagle-owl resembles the half-suppressed screams of a person being suffocated or throttled. Parrots have presented remarkable instances of talking. One whose imitative talent was reckoned most extraordinary, was purchased for five hundred dollars, out of a West India ship at Bristol. This bird not only repeated a great number of sentences, and answered questions, but was able to whistle, with the greatest clearness and precision, one of the psalms, "The Banks of Dee," "God Save the Queen," and some other favorite songs, and if by chance it mistook a note, it would revert to the bar where the mistake occurred and finish the air

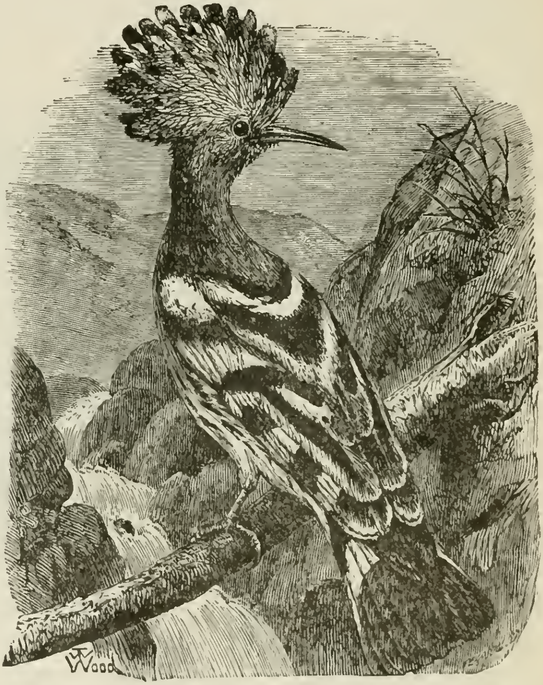


BIRDS THAT TALK—PARROTS.

with great accuracy. This bird had received a refined education, and its breeding and bearing were clearly that of a polished bird of rank.

One of the most beautiful birds is the hoopoe, or lapwing, a native of Europe and northern Asia and Africa. It was known to Palestine, and the Jewish people looked upon it as a proscribed bird. It is rarely eaten except in countries where it is very abundant, for instance, Egypt, France and Spain. Marshy ground, ploughed land, wooded districts, especially such as are near the water, are its favorite haunts. Its crest is very elegant, the long feathers forming it being tipped with black.

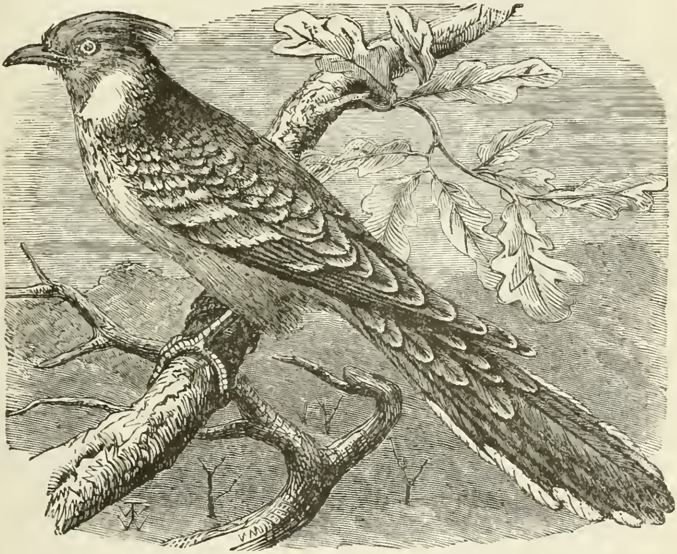
The cuckoo is called so from its notes which, in sound, resemble its name. It arrives very early in the season, and hence is mentioned as the harbinger of spring. Unlike any other creature that flies, except our cow bird, it has a singular habit of depositing its eggs in the nests of other birds, such as sparrows, finches and larks, and leaving these birds to do its hatching for it, and take care of its young. The little cuckoos oust the other young ones from the nest, and make themselves quite at home. From this arises the German saying, "as ungrateful as a cuckoo." The males are more numerous than the females, and are bad tempered and quarrelsome.



THE BEAUTIFUL HOOPOE

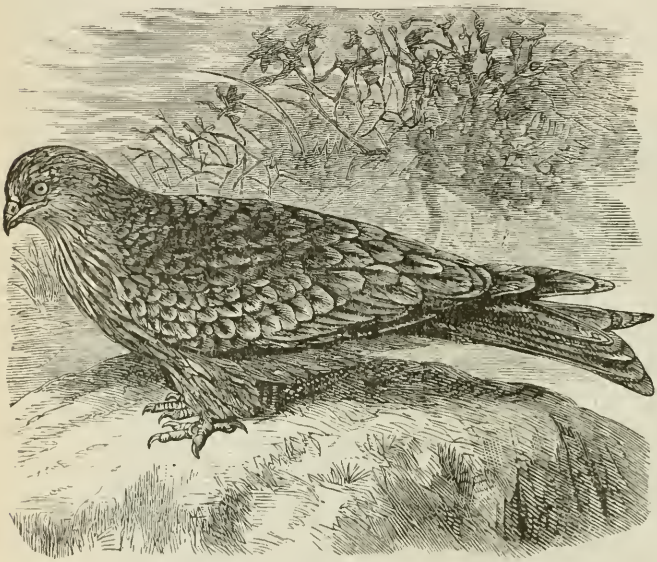
There is a tribe of little birds that are often hunted by the great spider. He is always on the look-out for them. He can catch them as easily as he does the humming-birds. They are called fly-catchers. The fly-catcher is as beautiful as the humming-bird. Her body is so tiny that it is no bigger than the tip of your finger, and is as light almost as a feather. She can sport amongst the water-lilies without making a ripple. When she settles on the leaves of the sensitive plant, they do not shrink. Her weight can hardly be felt. A large, bright flower, such as you meet with in the tropics, would make the little fly-catchers a tent, and afford them a safe and secure shelter.

But there is one species which is quite a giant among them, for it is nearly as large as a sparrow. The wings of the fly-catcher are of the most brilliant colors. Sometimes they are of a vivid green, and then she is called an emerald; or she will be compared to a ruby, or a diamond or any other precious gem. Thousands upon thousands of fly-catchers glisten and shine in parts of the forest where man could not live. He dare not brave the dangers he would meet with in these recesses. The air is unhealthy and full of poison. He would die of fever in a short space of time. There are venomous snakes, and poisonous plants and savage beasts. But, in spite of all the dangers, the bright fly-catchers revel, and are in their glory, enjoying their forest home.



THE UNGRATEFUL CUCKOO.

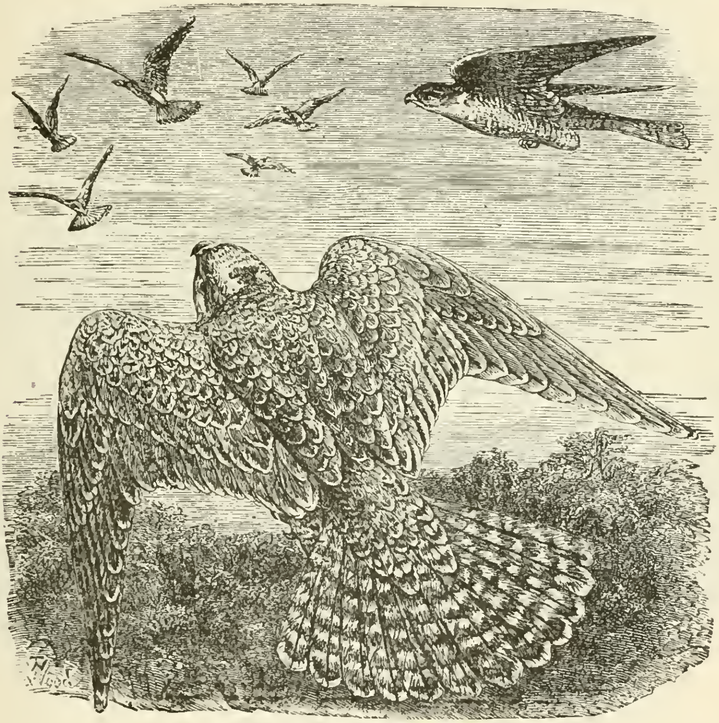
Among the decaying stems, and growing sometimes upon them, are the gayest and most fantastic flowers. The fly-catcher hovers over them. Her wings move so quickly you cannot see them. Her body all the time is still and motionless. Then her long bill is plunged into the depth of the flower, and an insect drawn out, or a sip of honey taken. The bird is a passionate little creature. If the flower has been emptied of its sweets, she goes into a rage. She will tear the bright petals to pieces, and scatter them to the winds. One of the fly-catchers is very fond of bees, as well as of honey; he is called the tyrant fly-catcher. He will take his stand on some twig or fence, near a row of bee-hives, and watch for the bees to come in and out. Then, he will pounce down upon them, one after the other, and eat them up. If his nest is near the farm-yard, no eagle or hawk dare come and carry off the farmer's chickens. Out will dart the brave little fly-catcher and attack him fiercely. Sometimes he will mount on the eagle's back and peck him with great violence, and torment him so much, that he will be only too glad to get away. In other instances he will gather his companions, pursue the deadly viper, and in spite of its venomous tongue and efforts to escape, will worry it to death.


A HIGH-FLYER—THE KITE.

The American kite is a large bird with long wings and forked tail. The back wings and tail have large feathers, black in color, with a metallic lustre. The flight of the kite is exceedingly rapid and graceful. It is very shy, keeps on the wing during the larger part of the day, and at night remains perched on the highest trees. Its nest is made of sticks and leaves, and is commonly well secluded. It can soar to an immense height, but when on the ground its gait is very awkward.

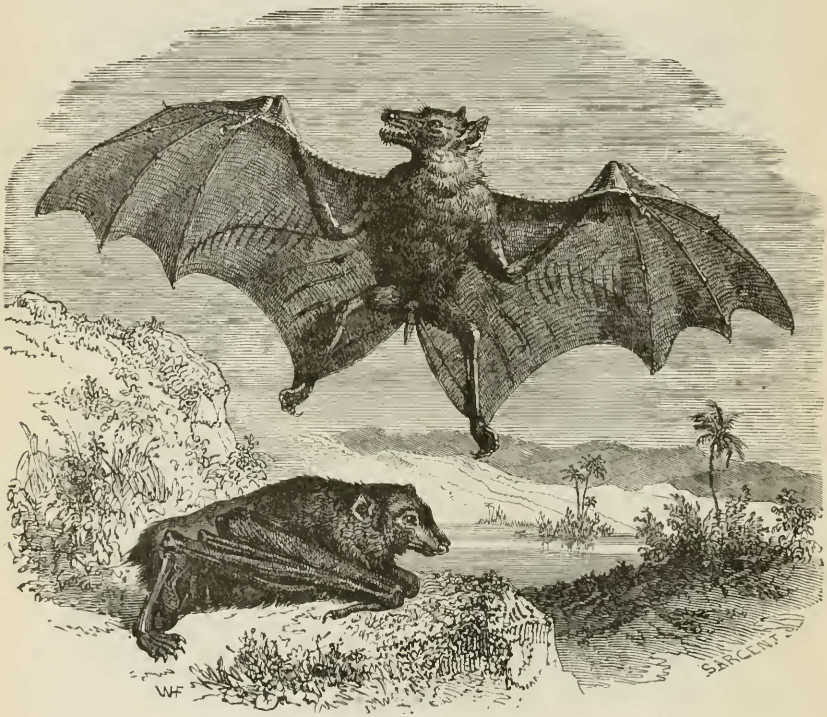
The falcon is ranked among birds of prey, whose pugnacious disposition and rapacious habits distinguish them from most of the species to be found in the world of birds. It has a short, curved bill, with serrations which answer for teeth, wings wide at the base, or next to the body, with long, pointed tips, a broad, fan-like tail, and a high degree of muscular power. The toes are long and slender, with claws curved and sharp. Old sportsmen used the falcon in the chase, for while it is strong and courageous it is also docile, and will return to its master when called.

A singular creature, of which we have some knowleage in our country, is of such construction that it is difficult to determine where it ranks in the animal kingdom. Yet, as it has wings and flies, we class it among the birds. The banyan tree, with its hundreds of spreading branches, gives shelter to man and animals. The beautiful green pigeon feeds and lives among its branches. And another creature, of a very different species from the pigeon, makes its home there. This Java bat is so large, that when its wings are spread, they measure six feet from the tip of one wing to that of the other. Thousands of these monstrous creatures shelter in the banyan tree all day. They hang from the branches by their claws, or else by the hook that is on their wings. They hang with their heads downwards, fast asleep. If any one disturbs them, they utter sharp, shrill cries, and begin to struggle in a very awkward manner. Their claws are so sharp, and take such fast hold of the tree, that they cannot in a moment get loose. When evening comes, the bat wakes up, and begins to feel hungry. He unlooses himself from the branch and flies out, flapping his great leathern wings. Thousands of bats fly out at the same time, like a cloud. The mother bat will have her little one sticking to her breast, transporting it easily.



THE LANNER FALCON.

Insects and little birds, and mice and rats, are the bat's food. But he has a great liking for ripe fruit, and is almost sure to go off to some garden and rob it. The bats settle on the trees, and commit frightful depredations. The poor man's garden is robbed as well as the rich man's. But the owner of the garden often takes his revenge. In the clear moonlight he can see the bats coming, flying at a slow, steady pace, and in a straight line. He loads his gun and takes his stand, and before the first bat has reached the tree there is a sharp report and a rattling sound, and down will drop the great bat, shot, perhaps, through the head. Others that venture near are apt to share the same fate.

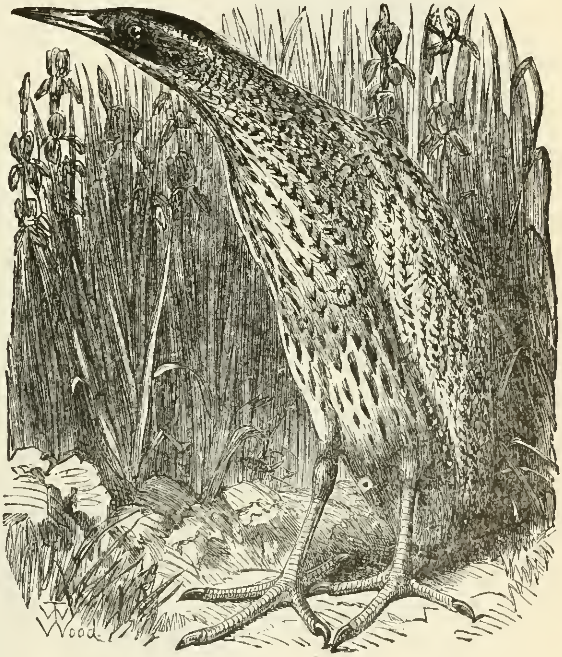


THE IMMENSE JAVA BAT.

Other winged creatures are equally marvelous. The bittern is one. It belongs to the heron family, and frequents localities that are low and marshy, It is famous for the peculiar sound it makes at night, a kind of booming unlike that of any other creature. Three species of the bittern are found in our own country, and the bird is also common to different parts of Europe. Like the dove, it is mentioned in Scripture. Though not building, like the stork, on the tops of houses, it resorts to ruined structures. It seems to be a lonely, desolate bird, which will serve to explain some of the allusions of the sacred writers.

The thrush is the name of a fine little bird belonging to a family that contains some of the sweetest songsters in the world. It is met with in the eastern part of our country, its locality extending as far west as the Mississippi valley. It has a varied color, brown on the upper part of the body, brightest on the head, and pure white below, with yellow legs and brown bill. When it sings, its notes are not many, but they rise and fall in cadence, and are rich and mellow. Its food consists of insects, berries and other small fruits. It is a high flyer, and is strong on the wing.

The earth has many treasures that man risks his life to get. There are pearls in the ocean, and there is gold in the mine, and coal deep in the pit where it would make your head giddy to look down. Man risks his life every day to get something or other that Nature has put almost out of his reach. But who would risk his life for a bird's nest? In China the rich people have a dainty dish, and it is made of birds' nests. No matter how hard they are to get, the Chinaman must have them for his table. They are sold in the market, and he buys them. The nests come from the island of Java. The coast of Java is very steep, and the cliffs have great holes or caves in them. The waves toss and roar about the caves, and numbers of birds fly in and out. You can hardly see them for the spray.

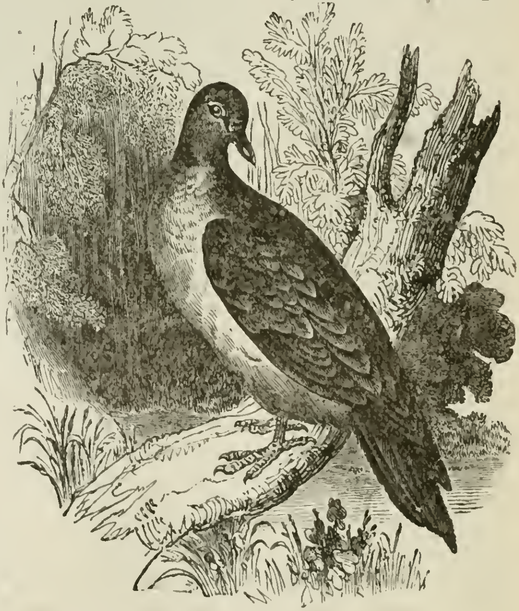


THE CURIOUS BITTERN.

The bird has a long name; but as it belongs to the swallow tribe, we will call it a swallow. There seems no place for the nest to be built upon. But the bird has found one. She fastens it to the roof and sides of the cave. These are the nests that the Chinaman likes to eat. The men are let down from the top of the cliff by a rope-ladder, till they reach the cave. They find the floor covered, as it always is, with the sea. They have to cling to the rough stones that stick out of the sides of the cave, and get a footing as they can. When they have got to the roof, they fasten ropes round the stones from side to side of the cave, and make a kind of rough bridge. On this bridge they have to stand while they pull down the nests.

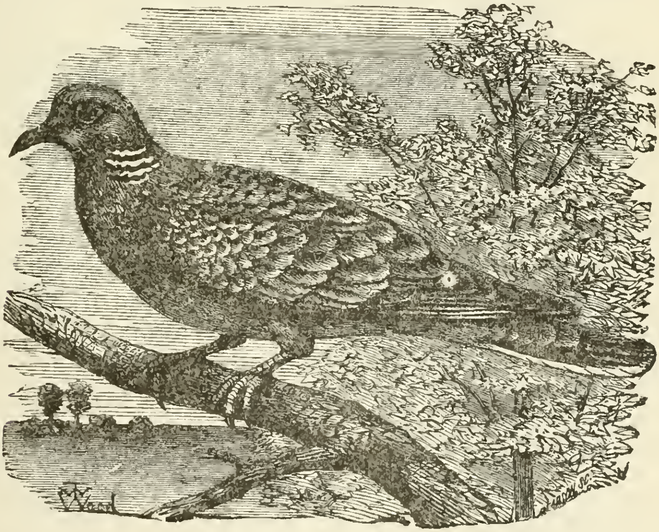
THE SWEET-SINGING THRUSH.

What danger these poor men are in! One false step and they would be lost. They dare not be let down the cliff, until they have offered up a prayer. They ask their gods to take care of them, and they place gifts on the tomb of the man who first found out the cave. The nests are thought so good to eat, because they are made of a kind of sea-weed. The bird swallows the sea-weed, and then brings it up in her mouth, quite soft and like pulp. She adds layer to layer until she has built her nest large enough. If the nests are old, they are not thought worth taking. They are like jelly and have no taste. But the Chinese cook puts in so many spices and other things, that he makes them very nice, indeed. The people of Japan know that the birds' nests are only made of sea-weed. They get the same sea-weed, and beat it soft, and boil it to a jelly. Then they make mock birds' nests, and bring them to the market to sell as a luxury.


THE TURTLE DOVE.

One of the most interesting species of birds is comprised in what may be called the dove family. The turtle dove is a general name given to several small pigeons. They are not so large as the ordinary domestic pigeon, have a smaller bill, longer toes, and a wedge-shaped tail. They feed on the ground, and roost in trees. More than a dozen species are to be found in Europe, India, and Africa. They are migratory, and are commonly seen in flocks of about twenty. A peculiar interest belongs to the turtle dove from the fact that it was employed in the Jewish sacrifices. From its habit of pairing for life, and its fidelity to its mate, it was a symbol of purity, and an appropriate offering.

One of the largest varieties of pigeons is the ring dove, measuring sixteen or seventeen inches in length. It is an arboreal species, perching on trees, and making its nest among the branches. It produces two eggs and then rears its little ones, doing this usually twice a year. The color of its breast is a reddish purple; the sides of the neck are a glossy green, flanked by a patch of white, which nearly forms a collar. It is found in even severe climates, and sometimes migrates to escape extreme cold, being sensitive to the various changes of the seasons.



THE RING DOVE.

Many tropical birds are marvels in their way, and some of the forests in the islands of the sea are the home of feathered tribes which are an amazement to the traveler. Lories display their vivid plumage on the branches above his head; gleaming kingfishers dart like lightning into the current of the slow stream that creeps by his side; his ears are filled with the noisy cries of cockatoos and parroquets, rising in shrillest clamor above the more musical strains of the few songbirds that inhabit the green recesses.

One of the denizens of the forest is the great, black cockatoo—a bird which, to a small, weak body, indifferently supported on long, weak legs, adds a colossal head, ornamented with a superb crest, and armed with a portentous hooked bill, surpassing all other bills, one would think, in size and strength! Well may it be called the Goliath! Apart from the enormous dimensions of its head and bill, it is distinguished by some remarkable characteristics. Its cheeks are covered with a naked skin, as is the case in the macaw, and they are of a bright blood-red color. The plumage is entirely black, yet assumes a greenish gray tint—from an abundant powdery white secretion scattered over the feathers. The tail is very short. The immense bill incloses a curiously small and slender tongue, unlike that of any parrot—or, indeed, of any other bird; cylindrical in form, capable of being considerably protruded from the mouth, and terminated by a cloven-horned extremity. It breaks up its food with its powerful beak, and then, protruding its cylindrical tongue, takes up a portion in the cleft at the extremity of the organ; the tongue is then retracted within the bill, and passed along the palate, where a small projection, coming in contact with the morsel of food, detaches it, and causes it to fall into the throat.

This bird is found in the lower parts of the forests, generally by itself, sometimes with one or two of its kind. It flies slowly, and makes but little noise in flying. It lives upon seeds and fruits, but more particularly on the kernel of the kanary-nut; which we may conclude to be its special food, from the manner in which it gets at it. So exceedingly hard is the shell of the kanary-nut, that only a heavy hammer can crack it, and as it is nearly triangular in shape, with a perfectly smooth outside, it would seem to defy the efforts of any bird.

The cockatoo, however, takes one endways in its bill, and holding it firmly by a pressure of the tongue, cuts a transverse notch by a lateral sawing motion of its keen-edged lower mandible. This done, it grasps the nut with its foot, and biting off a piece of leaf, retains it in the deep cleft of the upper jaw; and again seizing the nut, which is prevented from slipping by the elastic tissue of the leaf, fixes the edge of the lower jaw or mandible in the cleft, and by a powerful nip breaks off a piece of the shell. Again taking the nut in its claws, it inserts the elongated extremity of its sharp-pointed bill, and picks out the kernel, which, bit by bit, is then laid hold of by the extensive tongue. We see, then, that every detail of form and structure in this bird's remarkable bill has its special use—that everything is in its place, and that there is a place for everything.

CHAPTER XIX.

WONDERS OF THE INSECT WORLD.

Extraordinary Strength of Insects—Their Jumping Power—The Sprightly Flea—The White Ant—Ants' Intelligence—Insects that Keep a Dairy—The Brilliant Lantern-Fly—The Wonderful Bees—The Venomous Scorpion—The Ruinous Weevil—A Fly's Mouth—Butterfly Wonders—The Palmer Worm—The Painted Lady—A Singular Fly-Trap—The Sagacious Spider—Doctor Livingstone Poisoned—The Bloated Chego—Educated Fleas—The Mail-Clad Beetle—Destructive Locusts—The Enterprising Silkworm—A Great "Bore"—The Poppy-Cutter—Poisonous Insects—The Gad-Fly—The Leaf Insect—Insects Counterfeiting Death.

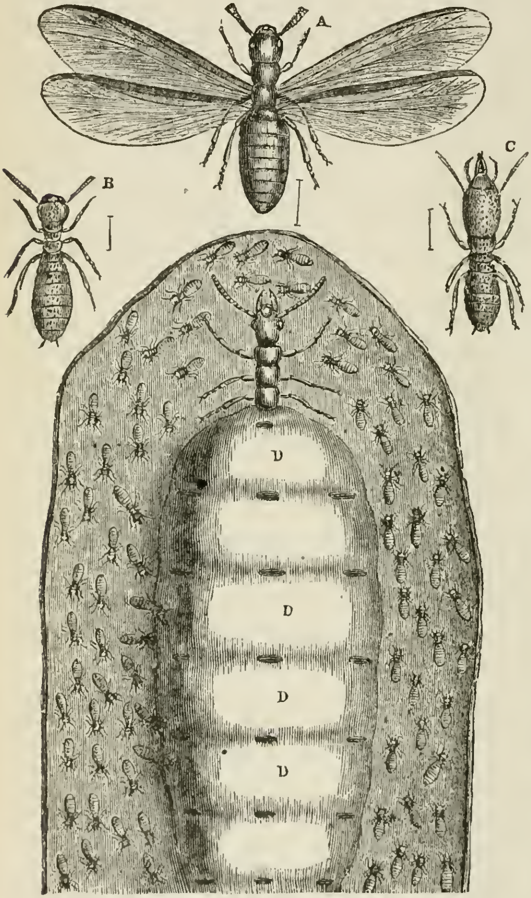
MANY people have observed how out of proportion a jump of a flea is to its size. A flea is not more than an eighth of an inch in length, and it jumps a yard; in proportion a lion ought to jump two-thirds of a mile. Pliny shows that the weights carried by ants appear exceedingly great when they are compared with the size of these indefatigable laborers. The strength of these insects is still more striking, when one considers the edifices they are able to construct, and the devastations they occasion. The white ant constructs habitations many yards in height, which are so firmly and solidly built, that the buffaloes are able to mount them, and use them as observatories; they are made of particles of wood joined together by a gummy substance, and are able to resist even the force of a hurricane. Man could scarcely build a more solid edifice.

There is another circumstance which is worth being noted. Man is proud of his works; but what are they, after all, in comparison with those of the ant, taking the relative heights into consideration? The largest pyramid in Egypt is one hundred and forty-six yards high, that is, about ninety times the average height of man; whereas, the nests of the white ants are a thousand times the height of the insects which construct them. Their habitations are thus twelve times higher than the largest specimen of architecture raised by human hands. We are, therefore, far beneath these little insects, as far as strength and the spirit of working go. The destructive power of these creatures, so insignificant in appearance, is still more surprising. During the spring of a single year they can effect the ruin of a house by destroying the beams and planks. It is well known what destruction is caused when a swarm of locusts alight in a cultivated field; and it is certain that even their larvæ do as severe injury as the perfect insect. All this sufficiently proves the destructive capabilities of these little animals, which we are accustomed to despise.

The average weight of man being one hundred and forty-two pounds, and his power of traction being one hundred and twenty-four pounds, the proportion of the weight he can draw to the weight of his body is only as eighty-seven to one hundred. With the horse, the proportion is not more than sixty-seven to one hundred, a horse one thousand three hundred and fifty pounds in weight only drawing about nine hundred pounds. The horse, therefore, can draw little more than half his own weight, and a man cannot draw the weight of his own body. This is a very poor result, if compared with the strength of the cockchafer, or may-bug. This insect, in fact, possesses a power of traction equal to more than fourteen times its own weight. If you amuse yourself with the children's game of making a cockchafer draw small cargoes of stones, you will be surprised at the great weight which this insignificant-looking animal is able to manage. The bee can draw twenty times the weight of its body; a beetle forty-two times its own weight. From this it follows that if the horse possessed the same strength as this last insect, or if the insect were the size of a horse, either of them would be able to draw one hundred and fifty-five thousand pounds. The proportion between the muscular strength of insects and the dimensions of their bodies, would not appear to be on account of their muscles being more numerous than those of vertebrate animals, but on account of greater intrinsic energy and muscular activity. The articulations of insects may be considered as solid cases which envelop the muscles, and the thickness of these cases appears to decrease in a singular manner according to the size of the creature. The relative bulk of the muscles being less in the smaller species than in the larger, it is necessary to explain the superior relative strength of the former by supposing them to possess a greater amount of vital energy.

These astonishing phenomena will perhaps be better understood if we consider the obstacles which insects have to overcome to satisfy their wants, to seek their food and to defend themselves against their enemies. To meet these requirements they are marvelously constructed for both labor and warfare, and their strength is superior to that displayed by all other animals. It is also much greater than that of the machines we construct to replace manual labor. They represent strength itself. God's workmen are infinitely more powerful than those invented by the genius of man, which we call machines. A close observer relates the following anecdote of a three-horned beetle, which is not larger than the ordinary English stag-beetle; this insect astonished me by a proof of its vast strength of body. When it was first brought to me, having no box immediately at hand, I was at a loss where to put it until I could kill it; but a quart bottle of milk being on the table, I clapped the beetle for the present under that, the hollow at the bottom allowing him room to stand upright. Presently, to my surprise, the bottle began to move slowly, and glide along the smooth table, propelled by the muscular power of the imprisoned insect, and continued for some time to perambulate the surface, to the astonishment of all who witnessed it. The weight of the bottle and its contents could not have been less than three pounds and a half, while that of the beetle was about half an ounce; so that it readily moved a weight one hundred and twelve times exceeding its own. A better notion than figures can convey will be obtained of this feat by supposing a lad of fifteen to be imprisoned under the great bell of St. Pauls, which weighs twelve thousand pounds, and to move it to and fro upon a smooth pavement by pushing within.

The white ants, already referred to, are met with in the savannahs of North America, in Guyana, in Africa, in New Holland and even in Europe, whither they have been imported. One traveler relates that in Guyana, he saw the negroes besieging certain strange buildings, which he calls ant-hills. They dared not attack them, except from a distance, and with fire-arms, although they had taken the precaution of digging all around them a little trench filled with water, in which the beseiged would be drowned if they made a sortie. These were the white ants' nests. The workers are a fifth of an inch long, the body soft and of an extreme delicacy, but the sharp mendibles or jaws capable of attacking the hardest bodies. The soldiers are twice as long, and weigh as much as fifteen workers, and may be distinguished by their enormous horned head, armed with sharp pincers. The male weighs as much as thirty workers, and attains to a length of nearly four-fifths of an inch. But another female leaves all these dimensions far behind. She attains to six inches in length, and weighs as much as thirty thousand workers. By a hideous contrast, the head alone does not increase in size. She is always motionless and captive in her cell, entirely occupied in laying. Her fecundity surpasses all bounds: sixty eggs a minute, more than eighty thousand a day. This prodigious laying goes on during the whole of the year. The larger she is, the more fruitful, the more inexhaustible, this terrible insect-mother seems to be the more adored by the fanatical rabble. She seems to be their beau ideal, their poetry, their enthusiasm. If you carry away with any rubbish a portion of their city, you see them instantly set to work at the breach to build an arch which may protect the venerated head of the mother, to reconstruct her royal cell, which will become (if there are sufficient materials) the centre, the base of the restored city. If all other species did not combine to destroy them, this truly prodigious mother would make them masters of the world, and its only inhabitants. The fish alone would be left; but insects would perish. It suffices to be remembered that the mother-bee does not produce in a year what the female white ant can produce in a day. By her they would be enabled to devour everything; but they are weak and tasty, and so everything devours them. In fact, birds are very greedy after termites; poultry destroy immense quantities of them. Other ants give chase to them and eat them by legions. The negroes in Southern Africa cannot be sated with them. They gather such as have fallen into the water, and roast them like coffee; thus prepared, they eat them by handfuls, and find them delicious. The Indians smoke the termites' nests, and catch those that have wings. They knead them up with flour, and make a sort of cake of them. Travelers, moreover, all agree in speaking of them as very nice food, comparing their flavor to that of marrow or of a sugared cream, and of excellent quality.



THE MONSTROUS WHITE ANT MOTHER.
Male (A), Worker (B), Soldier (C).

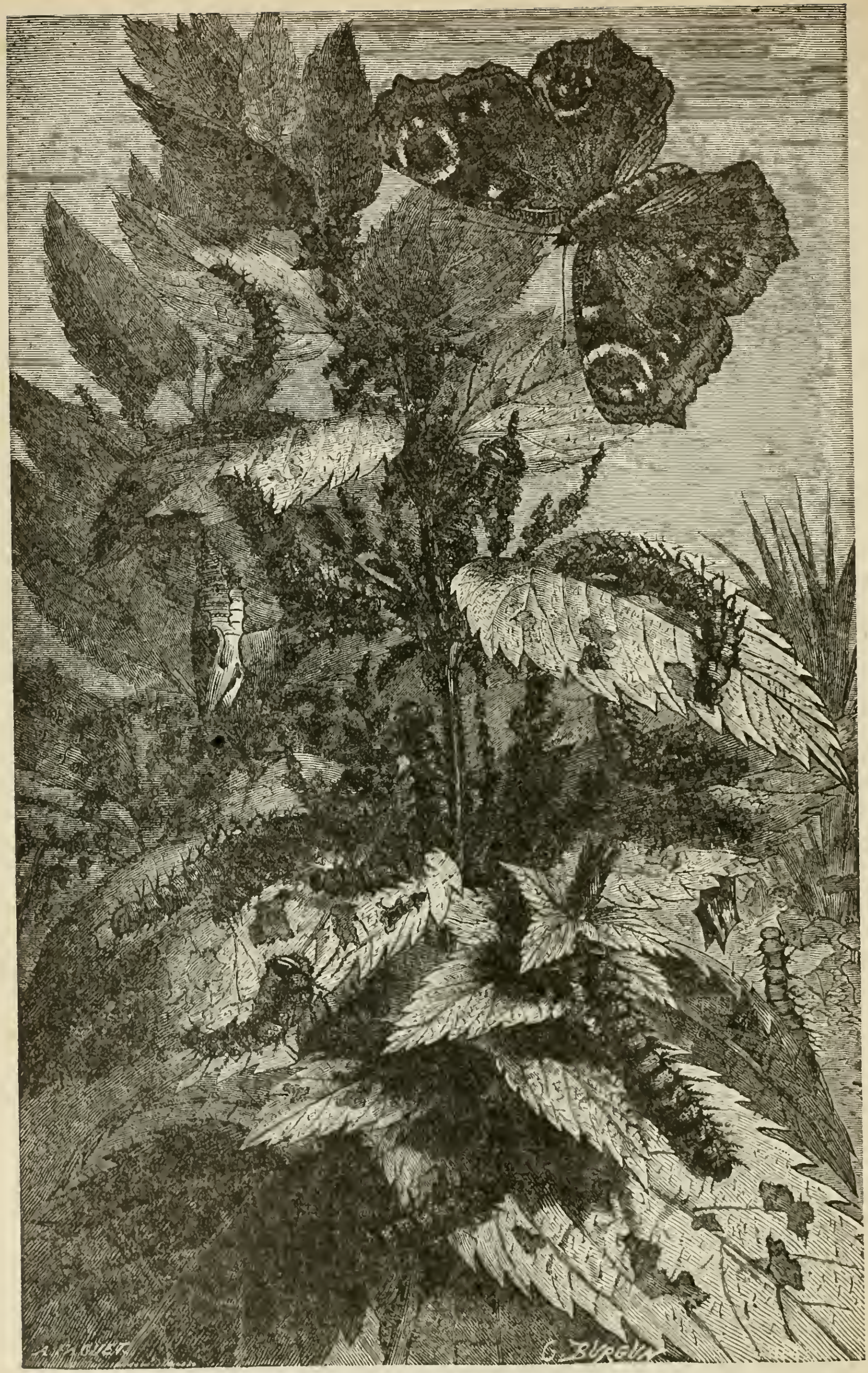
When Doctor Franklin was in Paris, as he sat quietly and alone at his breakfast one morning, he saw a number of black ants busy with the contents of the sugar-bowl. He drove them away, but they returned. Again he dispersed them, but in a few minutes they were seen climbing from lump to lump, as if nothing had happened. To try their ingenuity, he had the sugar-bowl suspended by a string from the ceiling. They endeavored to reach it by standing on each other's backs; several mounted in that manner and reached upwards, but in vain; the chain of ants fell down as fast as it was raised. After repeated attempts they went away, and he supposed they had given up the matter; but presently he saw them descending the string, and dropping down upon the lumps of sugar. They had scaled the walls, traversed the ceiling and discovered another road to the treasure.

Like our common bee, ants live in large communities. The ant-hill, the residence of these communities, is a wonderful construction, made of earth. It is about the form and size of a washing-basin turned upside-down, and contains within it innumerable chambers and galleries, made by the energy and industry of its little inhabitants. If a small piece of this house be broken, and the interior examined, it presents a scene of wondrous activity. Some ants rush hither and thither; some seize the eggs which have been exposed, and hurry with them to a place of safety; others apply themselves to repairing the breach. While thus engaged, the ants, on meeting, are often observed to stop, and, touching each other with their feelers, apparently have the power of communicating their ideas, and agreeing as to their work.

INSECTS THAT KEEP COWS.

Wonderful are the observations which have been made about these little animals; not the least of them is the discovery that some ants keep what may be called milch cattle. There is a small insect inhabiting trees, and the leaves and stems of plants. It is well known in green-houses, where its presence is greatly detested by gardeners, who use all means in their power to get rid of it. This little insect, called the aphis, is the milch cow to which the ants are indebted to for an important part of their sustenance. At certain times of the year the plants tenanted by the aphis are frequented by multitudes of ants, their object being to obtain a fluid which is secreted in the body of the aphis. This fluid, scarcely inferior to honey in sweetness, comes from them in drops, and is eagerly sought by the ants. The aphis, with its mouth fastened into the bark of the tree, is continually drinking in the sap, which, after having passed through its body, comes out as this sweet fluid. An ant is seen to caress an aphis with its feelers, and immediately the latter yields a drop of its honey, which is greedily swallowed by the ant.

More than this, by common consent it appears to be arranged that the aphides on a particular branch shall belong to the ants of a particular nest, and any other ant intruding on their preserves is treated with summary justice. The ants love their useful allies, will defend them


A. FAGUET.
G. BURGUN

BIRTH OF THE WONDERFUL LANTERN-FLY.

from aggression, and may be seen to carry them about in their mouths. Some kinds of ants treat their cattle in a still more curious way—they keep them in their own nest and supply them with their necessary food. When the aphis lays eggs the ants undertake the charge of them, bringing them out to the sun, and moistening them with their tongues, thus using all means to increase their stock of cattle by successfully hatching the eggs. Such valuable property as the aphides are naturally tempts the attacks of robbers. Tenants of a neighboring hill often make a raid with a view to capture them, and their owners fight for them with valor, knowing as they do how essential to the life of the colony is their stock of milch cattle, which must therefore be defended.

INSECTS THAT SHINE IN THE DARK.

Equally marvelous is the tribe of insects that have luminous properties. One of the most beautiful features of the savannahs in the tropics is the fire-fly. When the stars shine forth, the broad grassy meadow becomes illuminated with a thousand glittering lamps, almost as if it reflected the vault of heaven from its surface ; and the thicket and the forests are often full of their tiny but brilliant lights, flitting from flower to flower through the air, or shedding a mild refulgence over the surrounding foliage. It is said that the South American Indians, when they travel at night, attach several of them to their hands and feet, instead of carrying a lantern, whilst their wives use them for candles in the performance of their evening household duties.

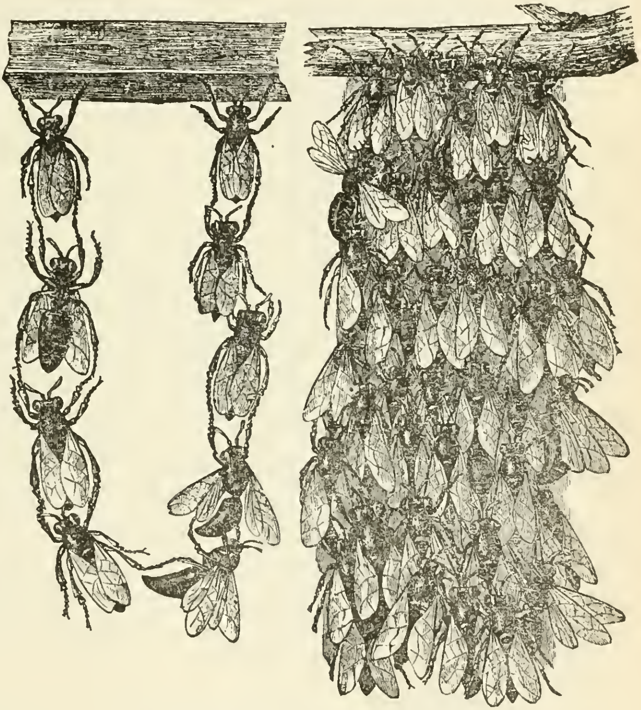
Many of the Indian tribes regard them with quite a childish pleasure, not only using them to adorn the hair of the girls, but decorating their holiday attire with them, as well as the trappings of their horses, for which purposes they often collect large numbers on feast days, when they amuse themselves in quite a theatrical fashion, dressing in the most fantastic costumes, with masks and skins, to represent various animals. There are a great many species of fire-fly known—perhaps more than a hundred—most of them indigenous to America, and distributed over the whole territory from New England to Chili.

From time immemorial the nature and habits of bees have formed a study for the curious, and an endless occasion for wonder. The female, or queen, is smaller than the male, and has a longer body than the working bees, and the wings, shorter in proportion, cover only the half of its body, whereas with the other bees they cover it entirely. The only part she has to play is that of laying eggs, and so she has no palettes and brushes. The sovereign is, as suits her supreme rank, exempted from all work. She is always escorted by a certain number of working bees, who brush her, lick her, present honey to her with their trunks, save her every kind of fatigue, and compose a train worthy of her feminine majesty. One very remarkable fact is that only one queen lives in each hive. Perfect sovereign of this tiny state, she rules over a people of some thousands of workers. It is not rare to find twenty-thousand working bees in a hive, and all submissively obey their sovereign. The number of males is scarcely one-tenth part of that of the working bees; and they only live about three months. The workers represent the active life of the community.

The exterior of a hive gives the best idea of this people, essentially laborious. From sunrise to sunset, all is movement, diligence, bustle; it is an incessant series of goings and comings, of various operations which begin, continue, and end, to be recommenced. Hundreds of bees arrive from the fields, laden with materials and provisions; others cross them and go in their turn into the country. Here, cautious sentinels scrutinize every fresh arrival; there, purveyors, in a hurry to be back at work again, stop at the entrance to the hive, where other bees unload them of their burdens; elsewhere it is a working bee which engages in a hand-to-hand encounter with a rash stranger; further on the surveyors of the hive clear it of everything which might interfere with the traffic or be prejudicial to health; at another point the workers are occupied in drawing out the dead body of one of their companions; all the outlets are besieged by a crowd of bees coming in and going out, the doors hardly sufficing for this hurrying, busy multitude. All appears disorder and confusion at the approaches to the hive, but this tumult is only so in appearance; an admirable order presides over this emulation in their work, which is the distinctive feature in bees. A very simple calculation may serve to give us an idea of this prodigous activity. The opening of a well-stocked hive gives passage to one hundred bees a minute, which makes, from five o'clock in the morning till seven o'clock in the evening, eighty thousand re-entrances, or four excursions for each bee, in a population of twenty thousand workers.

Let us now follow their occupations from the moment in which they establish themselves in a hive. The workers begin by stopping up all the openings except one door, which is always to remain open. A certain number set out to look for a resinous and sweet-scented substance, known under the name of propolis, which is destined to cover the inner surface of the hive, as its name shows, which is derived from a Greek word signifying outskirts, or suburb. This gum is viscous and very adherent. The bee works it up into balls, and carries it in this form to the hive, where other laborers take possession of it. They seize the pellet with their mandibles, or jaws, and apply it to cracks which they have to make air-tight. They use the propolis for another purpose still, which deserves to be mentioned.

It happens, sometimes, that an enemy penetrates into their hive, and that the bees are not strong enough to cast this intruder out of their dwelling. What do they do? As soon as they have discovered the invasion of their domicile, they set upon the impudent intruder and sting him to death. But how can they drag out the dead body, which is often very heavy, such, for instance, as a slug? On the other hand, it would be dangerous to abandon its carcass in the midst of the hive. A Roman Emperor said that the dead bodies of our enemies always smelt good. This is not the opinion of the bees. They know that if they abandon the carcass in the hive it would infect the place, to the great danger of their health. They therefore embalm it. They encase it in propolis, which preserves it from putrefaction. It is said that the art of embalming was practised for the first time by the ancient Egyptians. It is an error. The first inventors of this art were ingenious bees.

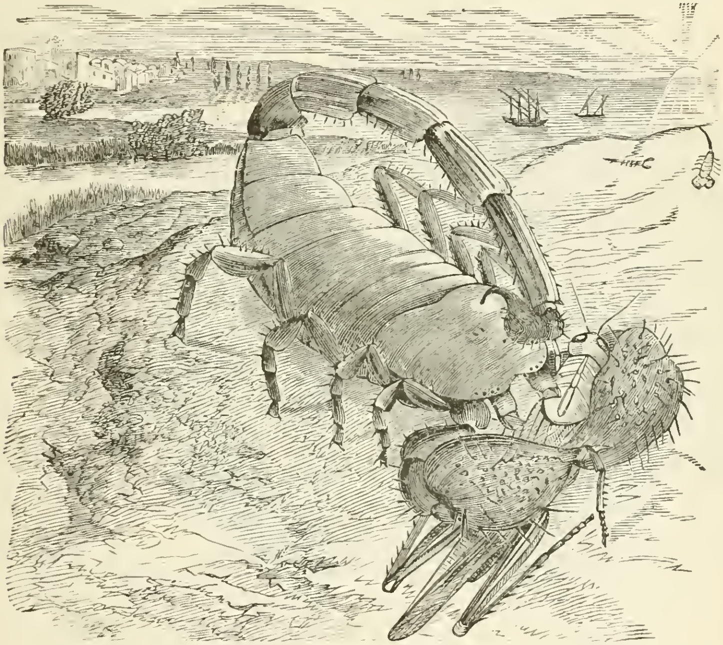

WONDERFUL CLUSTER OF BEES.

If, instead of a slug, it is a snail whose evil genius has conducted it into the interior of a beehive, the proceeding is more simple. The moment he has received one sting, the snail retires under the protecting roof of his movable house. The bees thereupon at once wall him in by closing the opening to his shell with this material. The shell is then cemented to the floor of the hive, and the house of the poor mollusk becomes its tomb, and remains thus in the midst of the hive, as a sort of decorative tumulus. When the sides of the hive are well closed, the bees lay the foundations of their cells. It was not formerly so easy to observe the details of the work done by the bees as it is at the present day; for these insects, once in their hives, have a great aversion to the light. If they are put into a glazed hive, their first care is to shut up all the windows, either by plastering them over with propolis, or by forming, by means of the well-marshalled battalion of working bees, a sort of living curtain.

When the working bees begin to construct their hives they divide the work among themselves. A first detachment is employed to gather the wax, which is the building stone of our little architects. It is easy to perceive the little plates of wax by slightly raising the last rings of the bee's body. The working bees suspend themselves from the roof of the hive in such a manner as to form festoons. The first clings to the roof with his front legs, the second hooks himself on to the hind legs of the first, and so on. They in this manner form chains, fixed by the two ends to the roof, which serve as a bridge or ladder to the bees which join this assembly. The result of all this is at last a cluster or swarm of bees which hangs down to the bottom of the hive. In this attitude they remain at first motionless, waiting till the honey in their stomachs is changed into wax. When the wax is sufficiently elaborated in its organs, one of them detaches itself from the group of which it forms a part. It takes between its legs one of the flakes of wax adhering to the rings of its body, kneads it with its mandibles, moistens it with its saliva, and gives it the appearance of a soft filament, which it sticks on to a projecting point of the roof. To this first layer it adds others, till it has exhausted all its wax. Then it leaves its post, and returns to the fields; another worker—another mason, as they are sometimes called—succeeds it, and continues the laying of the foundations. Presently shapeless blocks of wax hang down from the roof. It is in these blocks that other workers, with their mandibles, hollow out and form the first cells. While the workers continue to prolong the foundation wall, and whilst the first cells are being shaped, new ones are roughly sketched out or rough-hewn, and the work advances with a marvelous rapidity.

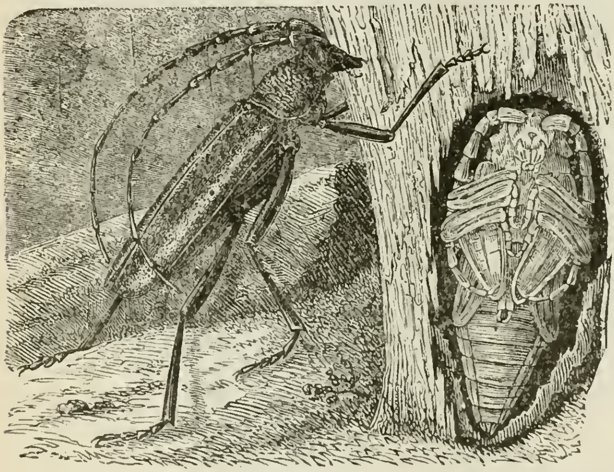
The honeycombs are the result of two layers of cells placed back to back, arranged in such a way that the bases of the one become the bases of the other, the base of each little cell being formed by the union of the bases of three opposite cells. The bees begin by forming the base of the cell; they then add the six sides, or walls, which are to complete the hexagonal cup. At the same time others set to work on the opposite side of the comb, and construct little cells back to back with the cells of the front surface. They do not finish them off at once. New workers succeed those who merely mark out the work, being occupied in planing down the rough-hewn-cells, and in reducing the walls to the desired thickness. This work is accomplished with an incredible celerity, for the bees can build as many as four thousand cells in twenty-four hours. There is very good reason for the hexagonal form being adopted by the bees in constructing their cells, as it involves a question of economy, which these insects have solved in their most admirable manner.

The bee is a producer, a benefit to man, who enjoys its labor and pays no price. There are insects, however, whose sole mission appears to be destruction. This may be said of the scorpion. The scorpion is one of the largest and most malignant of the insect tribe. It somewhat resembles the lobster in general appearance, but is much more hideous. It is from two to four inches in length. It lives upon other insects, but kills and devours its own species also. It frequents dry and hot places, and lies under stones and in the crevices of old ruins. The bite of the scorpion is generally fatal, but not always so. The poison is injected by means of a sharp, curved sting at the end of the six-jointed tail. It occasions great pain, inflammation, and hardness, with alternate chills and burning, and fortunate is the one who, having been stung, recovers from the dangerous wound.



THE DEADLY SCORPION.

The tribe of weevils must also be classed among destructive agents. One may know them by their head prolonged into a snout or trunk, by their rudimentary mouth, and by their elbowed antennæ, or horns. About twenty thousand species are said to exist. They feed on vegetables. Their larvæ are soft, whitish worms, without legs, with very small heads, and live in the interior of the stalks or seeds of plants, often occasioning enormous damage. They are one of the plagues of agriculture. Each of our dry vegetables, each variety of our cereals, has in this immense family its particular enemy. The pea weevil, which is brown with white spots, comes out of the pea at the end of the summer. The female lays her eggs on peas which are ripe, and still standing, in which the larva scoops out a habitation, and then makes its exit by a circular hole. It remains at rest all the winter, and is not hatched till towards the following spring. The bean weevil marks each bean with many black spots. The wheat weevil, of a darkish brown, lays its eggs on the grains, of which the larvæ then eat the interior. A host of ways of getting rid of the weevil have been proposed. The best means is to store grain properly, and to keep the heap well aired, driving out the pest by this simple process.


THE WEEVIL UNDEVELOPED AND FULL GROWN.

All vegetables, the vine, fruit trees, the ash, pines, as well as grains, are eaten by some weevil or other. One species takes the precaution of cutting half through the young stems and the stalks of the buds of the pine, so that the sap flows only with difficulty into the withered organ, and cannot suffocate the young larvæ. Other weevils hollow out galleries between the wood and the bark of different trees, when in the larva state, and devour the leaves in the adult state. They are sometimes so numerous in the forests that the trees are tattooed all over by the larvæ. Whole forests of oaks, aged from thirty to forty years, have been ruined by their ravages. One species, hairy, and of a tawny color, are a terrible plague to pine forests. In one season in the Forest of Hartz, one million five hundred thousand trees were destroyed by these insects. Often have the priests implored in the churches the Divine clemency, to put an end to the devastations made by them.

One genus has the antennæ very long; they exceed in some of the species two or three times the length of the body. The larvæ are large whitish worms, which live in the wood of trees, the adult insects frequenting flowers and rotten trees. In the month of June one meets them on the oaks, whose larva scoops out its galleries in the interior of the tree, and often occasions much damage.

Another tribe comprises what are called lady-birds. These little globular, smooth insects, red or yellow, with black spots, are very useful to us, for they clear the trees of other mischievous insects. Their larvæ make use of their front legs to carry their prey to their mouths. When danger threatens a lady-bird it hides its feet under its body, and remains sticking to the stem of the bush. If you touch it, it allows itself to fall to the ground, but sometimes opens its wings and flies off rapidly. It also exudes from the articulations of its body a yellow liquid, of a pungent and disagreeable odor. This is the only means of defence possessed by this little inoffensive and withal useful being.

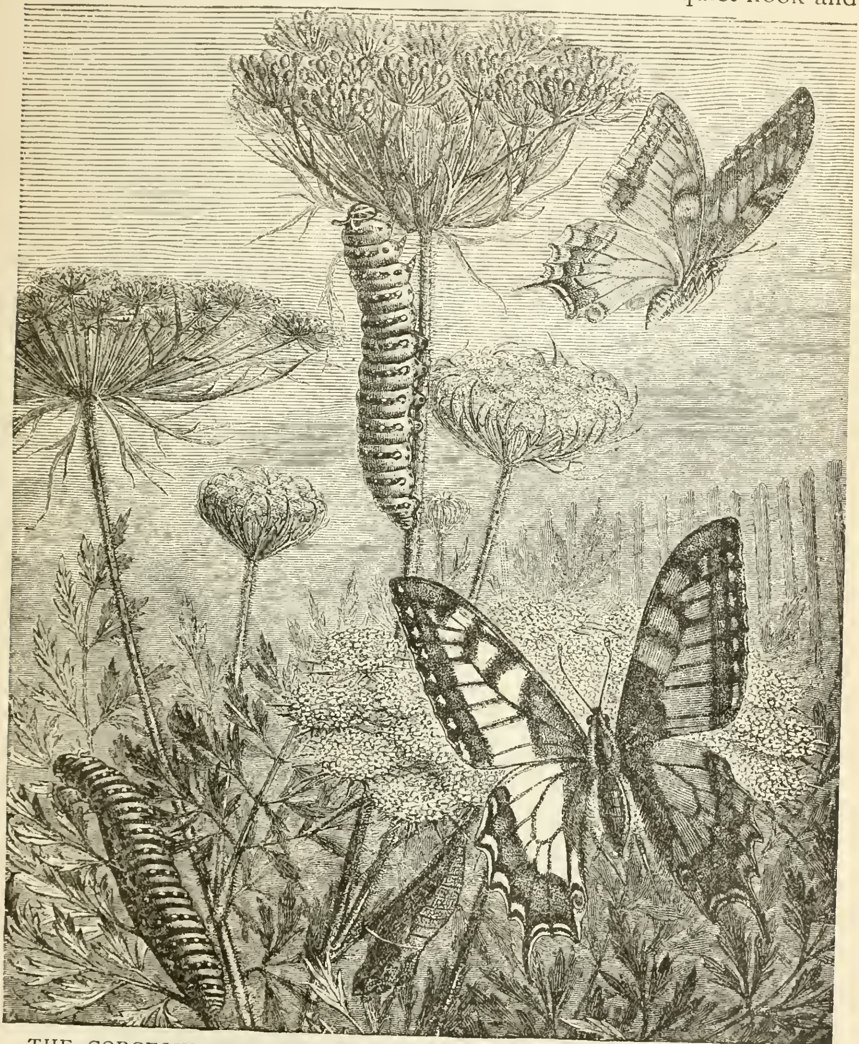
AN EXTRAORDINARY MOUTH.

The weevil is an out-door insect. There are insects that boldly step inside the house, and are familiar objects, yet of most marvelous construction. The eye of a common fly has four thousand lenses, or reflectors, each of use in the matter of vision, yet no part of fly structure is more wonderful than the mouth. Watch a common fly alight on a piece of sugar. From the under surface of the head apparently is unfolded a long organ looking like an additional leg; and with this the fly scrapes the sugar, licks up the cream, spoliates the jam, and effects destruction in other and varied ways. To understand what the organ is, let us briefly glance at the typical structure of the insect mouth. Four sets of organs or appendages compose the mouth. There is first an upper lip, then a pair of large jaws—forming a tube or tongue in butterflies—and last of all a lower lip. In a beetle the chief mouth organs are the greater and lesser jaws, while in a bee or wasp the jaws are also well developed for the work of the hive, but the under lip forms a tongue, wherewith the bee sucks up honey from the flowers. Now in the fly the mouth parts are of a modified nature. Speaking generally, the jaws are represented by small bristle-like organs, and the upper lip is developed; but it is the labium, or under lip, which comes to the front in the development of the fly's mouth. Here it forms, as in the bee's, the chief organ of nuitrition. It is the under lip which we see unfolded from beneath the head when the fly attacks the sugar. And when we place this organ beneath the microscope, we can readily discover the secret of its service.

The tongue, as we may term the under lip, consists of a stalk, highly movable and muscular, at the end of which a couple of broad leaves expand out from the middle to form a sucker-like organ, beautifully adapted for licking up fluids, and for scratching solid matters also. This fan-like end is supported on a firm tubular frame work, acting as a set of springs to open and shut the fans, while the microscope shows us that this structure is really like a file or rasp in its nature. We can understand then, readily enough, how such a muscular organ can be used for the purposes of fly nourishment. When after a summer of flies, the morocco covers of our books and the finely polished surface of our furniture are scratched and eroded, we can readily appreciate the cause of the damage. With this it wages war even on ourselves. For, as a famous authority on insects remarks, it is by its means that the fly teases us in the heat of summer, when it alights on the hand or face to sip the perspiration as it exudes from and is condensed upon the skin, thus causing an irritation which is anything but pleasant.

THE WONDERS OF BUTTERFLY LIFE.

Some of the old workers in stained glass who made the grand colored windows for ancient cathedrals and monasteries, were fond of producing figures of a gaudy butterfly, when they wished to represent the idea of the resurrection from the dead. The butterfly, with its expanded wings, gay colors and lively flight, was to them, as it is to us, a proof that beauty could follow hideousness in the ordinary course of nature, and it was an emblem that the immortal spirit would cast off the gross body of our senses and animal mind. What a difference there is between a green and yellow caterpillar, covered with bunches of hair here and there, and not smelling over nice, that gorges cabbage-leaves hour after hour and day after day, and the delicate white butterfly, with its black spot on its large wings, its long proboscis, which rarely is used, its silky body, pretty, long horns and hesitating flight! The caterpillar becomes a chrysalis, and this the perfect insect. To the eye there is a decided change of form—a metamorphosis; but to the anatomist there are proofs of internal and external changes in the construction of the tissues and organs that are most wonderful. Whence does the butterfly derive its wings? There is no trace of them in the hairy and thick skin of the caterpillar. If a caterpillar is dissected, the skin is noticed to cover some muscular fibres, by which the insect lengthens or shortens its body and crawls, and inside these is the cavity through which the green blood circulates, and which surrounds the great stomach. There are no traces of wings, and therefore it is not correct to say that the caterpillar contains the imperfect organs of the perfect insect. But when the caterpillar has grown to its full length, and cabbages have become rare, it retires to a quiet nook and begins to diminish in length. It fixes its hind legs tightly to a board or tree, by weaving a little web with its mouth, then it curves its body and fixes a silk thread on one side of it on the wood, and throwing its head backwards, it curves its body to the other side, fixing the thread


THE GORGEOUS BUTTERFLY, WITH CATERPILLARS AND CHRYSALIS.

on the opposite side on the wood. The caterpillar then straightens itself, and, being securely lashed by its feet, and tied tightly by its silken girdle to the wood, it changes its skin, and from under the old one appears the queer-looking thing, without legs, mouth or hairs, called the chrysalis. This has a brown skin, and on either side of the body is a sort of fold; and within this the process of wing-making is going on all through the winter, although the chrysalis never moves and does not eat or drink. The pretty body and the delicate head are being formed within the brown skin, and even the stomach is undergoing alteration in form, while the muscles of the caterpillar are being changed into those which can move the wings and legs of the butterfly.

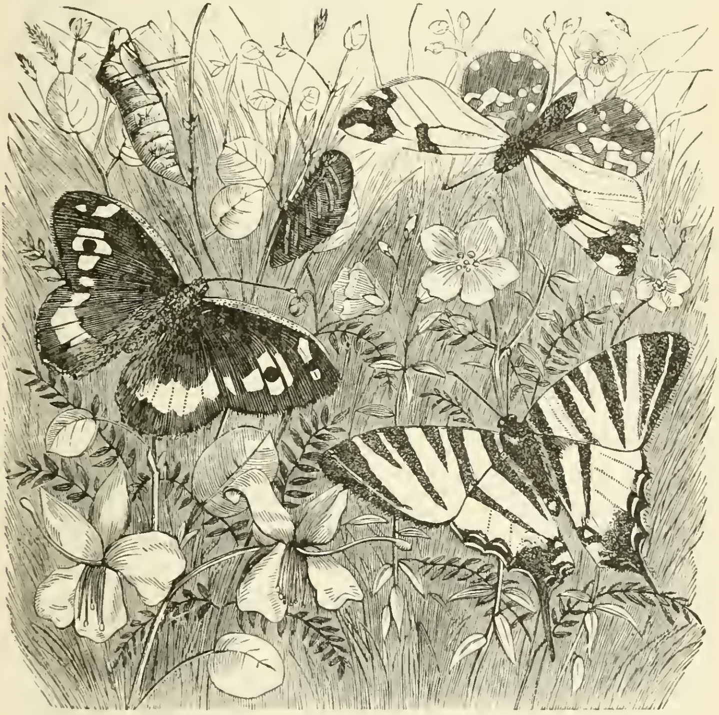
A MARVELOUS TRANSFORMATION.

At last, on some fine spring day, the brown skin of the chrysalis splits, and the butterfly comes out with its wings nicely folded. It soon gains energy in the sun, and breathes the fresh air, the wings unfold and become stiff, and the little creature flies off with a careless flight, but in a manner which no mechanism yet invented can enable man to imitate. Examined under a strong magnifying power, the wings are most beautiful. They consist of a fine membrane, quite transparent; it has two layers, and between them are the rib-like markings, which are really tubes formed by myriads of rings of membrane placed side by side. These tubes are the breathing apparatus, and the air passes into them and is carried by other tubes into the body, and amongst the muscles, and even around the stomach. On the layers of membrane are rows of very small, dark dots, one row regularly succeeds another until the wings outside and inside are covered.

The beautiful proboscis, which is curled up under the head of the butterfly, is very different from the sharp, crushing, cabbage-eating jaws of the caterpillar. It is rarely used; but when some very tempting flowers are near, the insect may unfold it and place its tip in the honey at the bottom of the flower. There is a small bag in the gullet which is connected with the proboscis, and it contracts and expels all the air out of the sucker. Then, when the end touches the honey, the bag dilates, and the sugary liquid rushes up. The butterfly takes but little food, for the caterpillar had laid in such a store, that it furnishes the new clothes of the perfect insect and its food as well. The caterpillar has this use, that it can spin a thread, which in some kinds is a true silk, but the butterfly has nothing of the kind to do. The butterfly lays eggs and glues them to the dry substance nearest the future food of the young, and every species regularly chooses the same kind of tree or shrub, generation after generation.

Closely resembling the butterfly is the palmer worm, mentioned often in the Jewish writings as a destructive insect, and regarded as a pest and a judgment whenever it made its appearance. Its beauty is not at all in keeping with its destructive power.

There is a very pretty butterfly called the painted lady, which is common in some parts of England, and it is very celebrated for its swarms, which have been known to pass over great distances. Most insects, and especially moths and butterflies, live exclusively in one country, in some particular island, or on part of a continent, but the painted lady is common in Europe, Asia and Southern Africa; moreover, it has been found in Australia, Japan and America. A vast swarm of these butterflies, forming a column from ten to fifteen feet broad, was once seen in one of the Swiss cantons. The myriads of beautiful, winged creatures flew onward in regular order from north to south with great rapidity. In the month of March of the same year, a similar swarm was observed, south of Switzerland, flying from north to south, and at night the butterflies alighted and covered the plants and flowers. These insects must have congregated together, in the first instance,



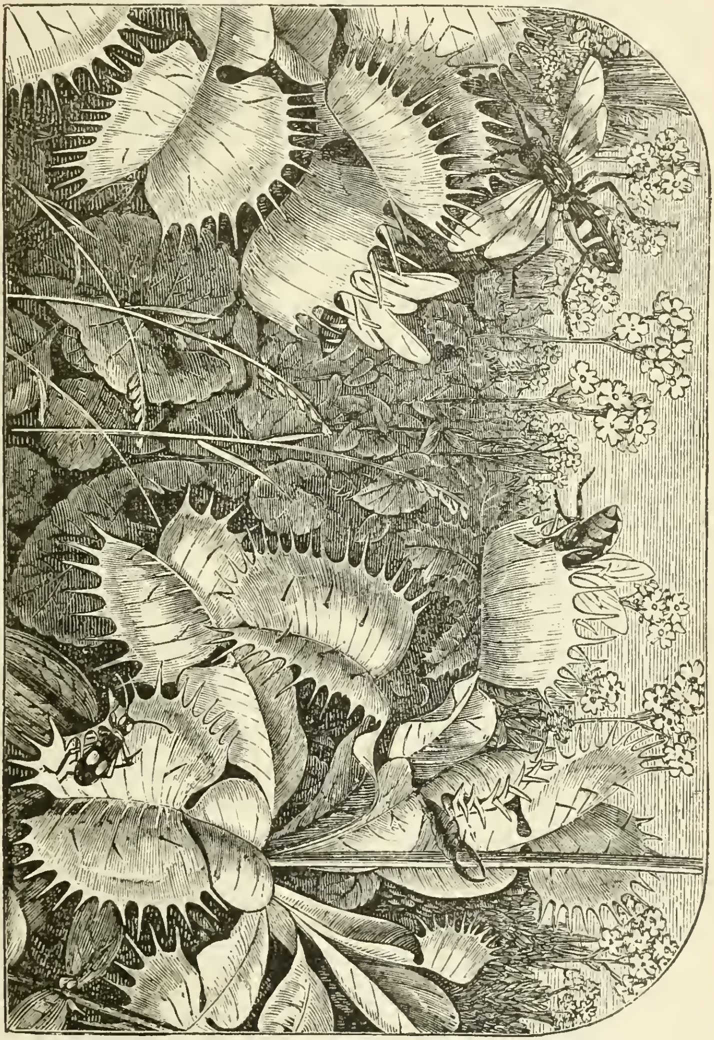
THE VARIEGATED PALMER WORM.

from considerable distances, and a common impulse directed them in their flight. These emigrations from one country to another do not occur in the lifetime of every painted lady, but only now and then after the lapse of many years. Many insects emigrate pretty regularly from one country to another, and yet live solitary lives until the time for moving commences; then, like the swallows, they collect together by some wonderful instinct, and fly away in enormous multitudes. The lady-birds, the locusts and the daddy-longlegs, are familiar examples.

VENUS' INGENIOUS FLY-TRAP.

Fly-traps are well-known in the animal kingdom to every one who has eyes, or at least who uses them. The delicate web of the spider, and the deeply cut and broad mouth of the swallow, at once suggest themselves as illustrations from among our animals. The spider, sitting at home at ease, waits the entanglement of his prey in his stake-nets, while the swallow opens his large sweep-net, and, dashing through myriads of may-flies or clouds of midges, secures hundreds of them. Both animals thus obtain their food; and other singular fly-traps could be enumerated from the animal kingdom equally well adapted to supply the necessities of their different owners. But that a vegetable should have an exquisitely constructed and perfect apparatus of this kind is very remarkable, when it is remembered that plants differ very markedly from animals in regard to their food. For, while animals live on organized substances—that is, on plants or other animals—vegetables live on inorganic substances, and a plant or an animal is of use to a living vegetable only when by decay it is resolved into its inorganic constituents. It is, then, unlikely that a fly could supply a plant with food, and yet a more perfect fly-trap than the leaves of the dionæa cannot be imagined, or one more successful in capturing its prey.

This little plant is a native ot the sandy bogs in the pine barrens of North Carolina. It grows to a height of from six to twelve inches, producing a loose head of large, whitish flowers. The flower-stalk rises from a rosette of yellowish-green leaves, spreading on the ground. Each leaf is divided by a deep incision into two portions, the lower being a broadly-winged footstalk, and the upper the blade or true leaf itself. This upper portion is the fly-trap—the most curious part of the plant—and demands a careful description. It is roundish, and divided into two equal parts by a strong mid-rib. The margins are fringed with a row of strong spiny bristles, so that it may be likened to two upper eyelids joined at their bases. The leaf is a little hollow on either side of the mid-rib, the upper surface is dotted with minute reddish glands, and each hollow is furnished with three slender bristles. The sensitiveness of the leaf chiefly resides in these bristles. If an insect alights on the leaf, and touches one or more of them, the sides suddenly close with a force so great as to imprison the little creature, notwithstanding all its efforts to escape. The fringe of bristles on the opposite sides of the leaf interlace like the fingers of the two hands clasped together, or like the teeth of a steel trap. The insect is not crushed or suddenly destroyed, but is retained firmly imprisoned until it ceases to move, which would generally mean until it was dead, and then the leaf slowly expands. When the bristles are irritated by man, the leaf quickly closes, remains closed for a short time, then slowly expands, ready to



A WONDERFUL LEAF THAT CATCHES FLIES.

close again if newly irritated. But if it be caused to make repeated efforts at short intervals, its movements become languid, or the sensibility is altogether exhausted, and is recovered only by a period of repose. Flies are often caught in other ways, as we all know, their great enemy cunningly setting a snare for them, from which it is impossible for them to escape when they become entangled.

WONDERS OF THE SPIDER'S THREAD.

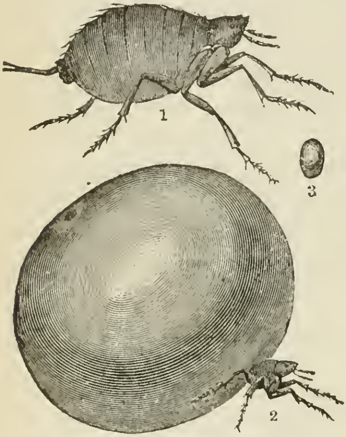
That any creature could be found to fabricate a net, not less ingenious than that of the fisherman, for the capture of its prey; that it should fix it in the right place, and then patiently await the result, is a proceeding so strange, that if we did not see it done daily before our eyes by the common house-spider and garden-spider, it would seem wonderful. But how much is our wonder increased when we think of the complex fabric of each single thread, and then of the mathematical precision and rapidity with which, in certain cases, the net itself is constructed; and to add to all this, as an example of the wonders which the most common things exhibit when carefully examined, the net of the garden-spider consists of two distinct kinds of silk. The threads forming the concentric circles are composed of a silk much more elastic than that of the rays, and are studded over with minute globules of a viscid gum, sufficiently adhesive to retain any unwary fly which comes in contact with it. A net of average dimensions contains eighty-seven thousand of these globules, and a large net of fourteen or sixteen inches in diameter, one hundred and twenty thousand; and yet such a net will be completed by one species in about forty minutes, on an average, if no interruption occurs!

Across the sunny paths of Ceylon, where the forest meets the open country, and which constitute the bridle-roads of the island, an enormous spider stretches its web at the height of from four to eight feet from the ground. The cordage of these webs is fastened on either side to projecting shoots of trees or shrubs, and is so strong as to hurt the traveler's face, and even lift off his hat, if he is so unlucky as not to see the line. The nest in the centre is sometimes as large as a man's head, and is continually growing larger, as it is formed of successive layers of the old webs rolled over each other, sheet after sheet, into a ball. These successive envelopes contain the limbs and wings of insects of all descriptions, which have been the prey of the spider and his family, who occupy the den formed in their midst. There seems to be no doubt that the spider casts the web loose and rolls it round the nucleus in the centre when it becomes overcharged with carcases, and them proceeds to construct a fresh one, which in its turn is destined to be folded up with the rest.

A gentleman relates that he has often tested the intelligence and perseverance of the geometrical spider by the following, it must be admitted, aggravating experiment. Taking a piece of paper and rolling it between his fingers, he has thrown it into the web, taking care that it is not heavier than the weight of a fly. The spider runs along with alacrity towards his supposed prey, and soon discovering its unpalatable nature, carefully disentangles it, and drops it clear of the web to the ground by stretching out his first pair of legs, just as a human being might reach out his arm. He then returns to his place in the centre, and in a moment or so a piece of paper is thrown into another part of the web. The spider acts as before, and will do so, without much variation, a few times. The fifth or sixth time he rushes at the paper with an appearance of anger, or runs an inch or two along the strands as if enraged, and then back again; pauses a moment or so, as if to recover his equanimity, and then goes briskly to his disappointment, and again carefully disentangles the paper. All these movements, from the evident feeling and intelligence shown, are full of interest to the observer of nature, and they are sufficiently varied in individuals to make the experiment worth trying any number of times. Occasionally, for example, the spider, after he has been deceived a few times, will stretch out all his feet upon the strands, without moving from his place, and shake his web angrily; or he will jerk the paper out much as one might fillip it away from between the finger and thumb, with a decisive sharpness, very significant of passion.

The habits of the tarantula, a name given to a large spider, are very curious. Its jaws and feet are large and strong; its legs and feet are furnished with long stiff spurs, with which the animal seizes its prey; and its foremost two pairs of feet are furnished with a down, like a brush, which the tarantula employs in making its toilette, and in crawling on smooth surfaces; the feet are terminated by two strong nails. When full grown, it inhabits underground passages, forming a burrow sunk to the depth of a foot beneath the surface; and this burrow not only protects the animal from the pursuit of its enemies, but serves it as an observatory, whence it may dart on its prey. At first the hole sinks perpendicularly, then bends and forms an almost horizontal elbow, after which it resumes its direction downwards. At this elbow the tarantula stands sentry, never losing sight of the door of its dwelling; and here the creature's eyes glitter like diamonds, rendered bright, like those of a cat, by darkness. Externally, the opening of the tarantula's burrow is surmounted by a funnel, constructed of pieces of dry wood, united by clay, and lined with a web spun by the spider, which is continued through the whole interior of the burrow. This prevents the fall of earth, and enables the tarantula by its claws quickly to ascend or scale its fortress. The Apulian peasants imitate at the mouth of the hole the humming of an insect by means of an oaten stalk, and so lure the tarantula to the mouth of the burrow, and capture him. It is easily tamed. A naturalist put two full-grown and very vigorous male tarantulas together in a glass vase, and then witnessed a combat fought with wonderful strategy, until the ferocious vanquisher mortally wounded his enemy in the head, and then devoured him.

Livingstone was once bitten, when half asleep, by a light-colored spider. Feeling something running across his forehead, he put up his hand to wipe it off, when he was sharply stung on the hand and head, and the pain was very acute, but it ceased after two hours. The natives declare that there is a small, black spider in the country whose bite is fatal, but the great traveler did not meet with an instance in which death could be traced to this insect, though he saw a very large black, hairy spider an inch and a quarter long, and three-quarters of an inch broad, which had a hook at the end of its front claws similar to that at the end of the scorpion's tail. When these hooks were pressed the poison came out. There are spiders in South Africa which seize their prey by leaping upon it from a distance of several inches. When alarmed, they can spring about a foot away from the object of their fear. A large reddish spider obtains its food in a different manner from either, by patiently waiting in ambush, or by catching it by a bound. It runs about with great velocity in and out, behind and around, every object, searching for what it may devour, and from its size and rapid motions excites the horror of every stranger. It does no harm to men except to make the nervous, and those that hate spiders, very uncomfortable. This active little insect is very clever, for it imitates the mason-spider, and makes a nest in the earth lined with beautiful soft silk, covered with a nicely-fitting trap-door about the size of a quarter of a dollar. When this is shut it is so cleverly covered with hard earth that it cannot be distinguished from the rest.



1. Male Chego. 2. Female Chego, dilated with eggs. 3. Egg.

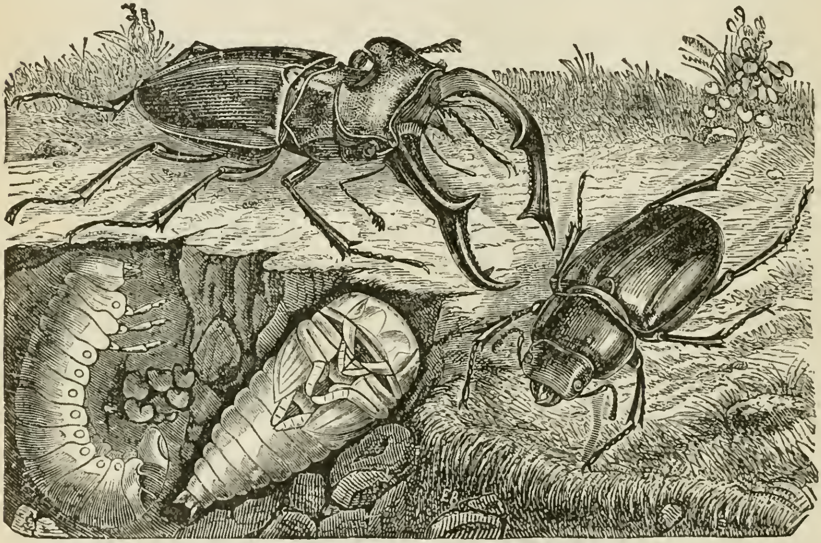
There is in South America an annoying insect called the chego. A traveler gives us this experience of a lad in the party who was stung, and of his nurse who began to search for the cause of his painful sensations. After a little time she produced between her finger and thumb a creature considerably smaller than an ordinary flea, which she had taken out alive and uninjured. Giving it a squeeze, she threw it to the ground with an expression of anger at its having dared to molest her young master; and thus in a very short time she had extracted three or four insects from each of his feet. We had, meantime, begun to feel something uncomfortable in ours, and on examining them, we found that a chego had taken possession of each of our big toes. The chego is a black, little creature, which makes its way quietly under the skin, where, having got to a sufficient depth, it lays its eggs, and unless removed immediately, causes annoying and dangerous ulcers, not easy to cure.

EDUCATED FLEAS.

Speaking of the flea, some years ago a strange little man, with a quaint-looking box, used to take his stand in various parts of London as soon as it was dusk, during the winter months, and silently invite the passing crowd to stay and take a peep into this quaint-looking box, which was lighted by a candle placed inside of it, the light of which shone through various colored papers, and exhibited a transparent description of the object for which he hoped to gather halfpence—"A flea chained up by the neck, alive." A convenient magnifying-glass was let into the side of the quaint box, in order that the object exhibited might be the better viewed. Some were very quick, according to this man's account, and others he could make nothing of. The chains, cars and locks which these little beasties drew were of silver, and, as the strange little man said, all constructed by himself. He had one flea which had been with him twenty-six months, and declared that he knew of still older ones, and he was accustomed to feed his fleas, twice a day, by allowing them to suck from the back of his hand. He declared that he was the last man who possessed the secret of educating these lively insects.

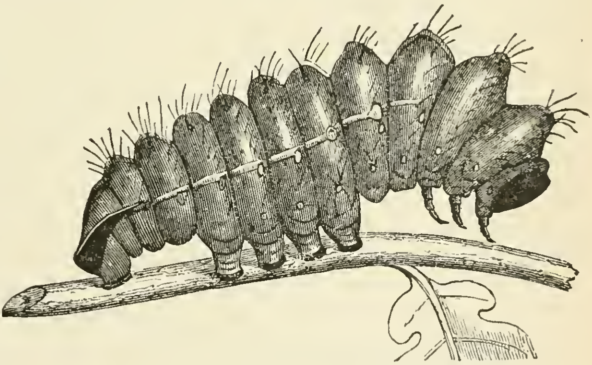
We come now to that strong mail-clad, brilliantly-colored insect, the beetle. The family contains the stag beetles. These are of great size, and their head is armed with enormous robust mandibles, which give them a ferocious air, which their inoffensive habits do not in any way justify. They live in half-rotten trees, the destruction of which they accelerate. Their mandibles, of such prodigious size only in the male, are of more inconvenience to them than they are of use, as they impede their flight. They do not attack other insects, and live only on vegetable juices. The common stag beetle attains to a length of two inches, or more, including its mandibles, and is of a dark brown chestnut color. They are met with during the months of May, June and July, in large forests, climbing along trees and hooking themselves on to the trunks by their jaws. The stag beetle imbibes the honeyed liquid which is found on oak trees, a tree it particularly seeks after, which has caused it to be called in Swedish, Ek-Oxe (Oak ox). It is supposed that it eats the leaves also. Beetles only fly in the evening, holding themselves nearly straight, so as not to see-saw. Their larvæ—which are whitish, with russety heads, live in the interior of trees, their existence in that state lasting nearly four years. Many naturalists think that the larva was eaten by the Romans, and figured on the tables of the rich patricians, and particularly of Lucullus.

In one of the geological formations of England, which is called the lias, there are layers of earth almost entirely formed by the wing-cases of beetles. There is lime in the earth, which has turned the original matter of the wing-cases into a sort of hard chalk, and the layers are called insect limestones. It is at first difficult to form an idea how such a vast number of beetles could be got together to form thick layers of their wing-cases. These cases are the parts which last the longest after death, and doubtless all the rest of the insects was destroyed. Geologists prove that the layers containing the insect remains were deposited as silt at the bottom of a large lake or quiet river; so it must be supposed that during many years the beetles frequented the neighborhood of the lake and died on its surface. Beetles are not very destructive, but this cannot be said of the locust, that scourge which has wrought devastation in both ancient and modern times.



THE UNIQUE STAG BEETLE.

The Egyptian plague of locusts has happened more than once since that early date. Africa, especially that part near to Egypt, has been at different times infested by myriads of these creatures, which have consumed nearly every green thing. The effects of the havoc committed by them may be estimated by the famine they occasioned. St. Augustine mentions a plague of this kind in Africa which destroyed no less than eight hundred thousand men in the kingdom of Massinissa alone, and many more in the territories bordering upon the sea. It is also related that in the year 591 great hosts of locusts migrated from Africa into Italy, and after grievously ravaging the country were cast into the sea, and there arose a pestilence from their stench which carried off nearly a million of men and beasts. In the territory of Venice, in 1478, more than thirty thousand persons are said to have perished in a famine occasioned by the devastations of the locusts, and instances of their dreadful numbers have been recorded in France, Spain and Germany, and, at times, in some parts of our own country, especially in the West.



THE OAK-FEEDING SILKWORM.

It is pleasant to turn away from such destructive creatures as the locusts to one that serves a much better purpose. It is not handsome, but, like many other plain things, it is very useful. The various diseases, which, for the last fifteen years, have been so fatal to the mulberry silkworm, have suggested the idea of acclimatizing in this country other silk-producing worms, if not with the view of superseding, at least as auxiliaries to the mulberry species. Among the species which have, in this respect, the greatest claims to our attention, we must place in the first rank those which feed upon the leaves of the oak tree. Indeed, the trees which can be made use of for their cultivation are very numerous, and, moreover, the silk produced by these worms appears to possess superior qualities. There are three oak-feeding species. The silk is as bright as that of the mulberry silkworm, but a little less fine and strong, and occupies the first rank after it. The eggs were brought from Japan—where this worm is reared—conjointly with the mulberry silkworm. The larvæ hatched at Paris were green, of a great size, remained in that state eighty-two days and were easily reared. Their cocoon resembles that of the mulberry species. It is composed of a beautiful silk of a silvery whiteness in the interior, and of a more or less bright green on the exterior. The moth is very large and beautiful, of a bright yellow color, approaching orange. All worms are not so valuable as the one just described.

Many of the lower forms of animal life possess powers of boring which, considering the soft materials of which they are made, seem very surprising. It is hard for us to understand how such animals are naturally provided with tools adequate, in some cases, for penetrating into the densest timber, or in others even into the solid rock. There is a shell which excavates for itself a hole in the solid rock. This animal has no English name; its Latin one is Pholas. It is to be met with in limestone rocks on the sea coast, into which it bores holes to a depth of several inches.

It is still a disputed point among naturalists as to how this boring is effected. Some think that the animal is enabled to secrete some acid which softens or dissolves the limestone, while others think that it is by the mechanical process of grinding that it is accomplished. The preponderance of opinion seems to lie now with the latter view. Another boring shell is the well-known ship-worm or teredo. This burrows into wood to a great depth, and many an otherwise good ship has been rendered unseaworthy by the attacks of this indefatigable borer. Of course a metallic coating to the vessel is a complete preservative against their attacks, and only in this way can their ravages be prevented.

A NOVEL WOOD-BORER.

The animal that accomplishes great excavations in the trunk of a tree is not a shell-fish, but an insect. The hole bored into the heart of solid wood is about fourteen or fifteen times longer than the body of the beetle, and the animal must, by the help of its jaws, tear away and remove a bulk of timber more than twenty times its own bulk. We shall gain some idea of the amount of labor necessary for this, by considering what would be the corresponding work that should be executed by a man, were he to be equally adapted with the beetle for this kind of work. He would have in a few days to bore into a mass of solid timber a cylindrical hole, about eighty or ninety feet long, and about three feet in diameter.

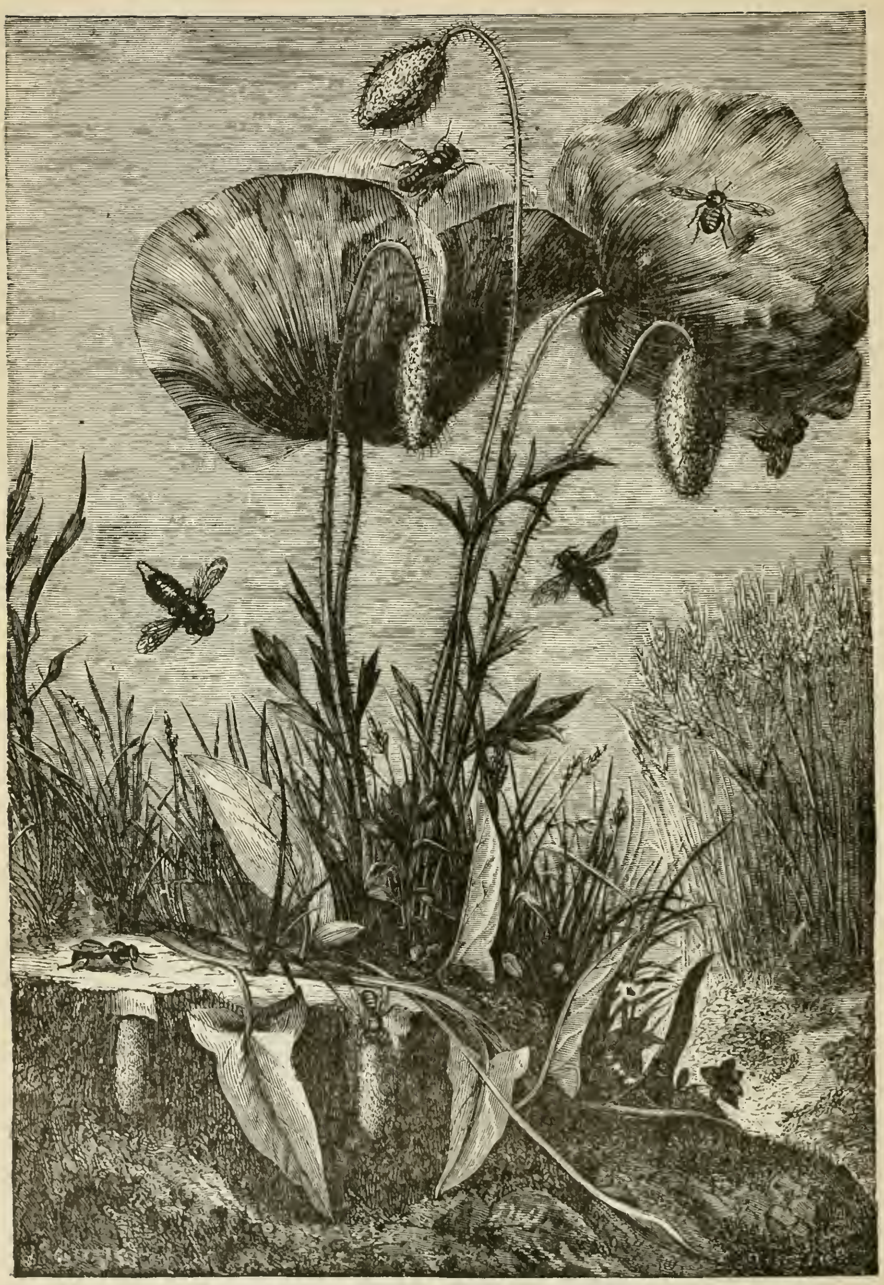
When the eggs of the beetle are hatched, the little animal that comes from them is at that stage of its existence utterly unlike its parents; and it is equally true of every other insect, that in the early stages of its existence it is utterly unlike in appearance, in food and habits, to the parents from whom it has sprung. The food which supports the little grub is the solid wood of the tree itself. Thus the little creature finds, the moment it becomes conscious of its existence, the food which nature intended for it surrounding it in boundless profusion. At once it commences to eat the wood that is under it, and thus it speedily excavates for itself a little hole, the bottom of which gradually deepens as the insect proceeds. Its brothers and sisters, likewise hatched about the same time, commence each to eat their small hole, and thus from the main tunnel a number of small holes gradually extend through the trunk, all commencing, of course, from the hole originally made by the parent insect, and radiating from it in lines nearly straight.

POPPY FLOWER CUTTERS.

There is a certain class of bees which construct nests or rather make a home of the petals of flowers. These bees are called "flower cutters." The species here described use the leaves of the scarlet poppy exclusively, and are called "poppy flower-cutters." Nothing can exceed the exquisite workmanship of their home, or the delicate material of which it is constructed. The female does the work. A nice, dry place is selected in a sandy soil, in which she digs a perpendicular hole, the sides of which are padded until they are hard and solid. She then searches for a young poppy, selects the most delicate and beautiful leaf, from which a small piece is cut and carried in a hole. In pushing this down it is necessarily crumpled up; but the little architect fully understands her business, and in a short time every wrinkle is removed, and the gaudy tissue is rendered perfectly smooth. Another piece is then introduced and managed in the same way, and so on until a nest is completed which, for beauty of workmanship and softness of texture, would rival the downy couch of an eastern princess. In this are placed the egg and future sustenance of the young poppy cutter. She seems to know she has built "in the sand," and before closing it up she carefully folds in the upper four edges of the lining, so that no grain of sand can fall inside. The hole is then fenced up so that no trace of it can be seen, but within which has begun one of those singular metamorphoses which have excited the wonder and admiration of naturalists in all the world. They are small insects, velvety black, with a white down on parts of the body, and not without traces of beauty.

POISONOUS INSECTS.

There is a fly in South Africa whose bite is very fatal to oxen, and as these are the drawers of the great wagons of the travelers, this very annoying insect often prevents very important journeys. The tsetse is not much larger than a common house-fly, and is nearly of the same brown color as the honey-bee. The after part of the body has three or four yellow bars across it; the wings project beyond this part considerably, and it is remarkably alert, avoiding most dexterously all attempts



THE CURIOUS POPPY CUTTERS.

to capture it with the hand. Its peculiar buzz when once heard can never be forgotten by the traveler whose beasts of burden are domestic animals; for it is well known that the bite of this poisonous insect is certain death to the ox, horse and dog. In one journey, Livingstone, who was not aware of any great number of the tsetse having alighted on his cattle, lost forty-three fine oxen by its bite. He watched the animals carefully, and did not believe that a score of flies were ever upon them. A remarkable feature of the bite of the tsetse is its perfect harmlessness to man and wild animals, and even calves so long as they continue to suck the cows. The poison is not inserted by a sting, but by the long proboscis which comes from the mouth. This consists of three blades, the two external being shields to protect the central lancet which has a poison bag at its root. The fly simply sticks this into the skin just like a gnat or gad-fly, and after sucking the blood until its body swells up, it departs. In the case of oxen, no immediate effects of the bite come on; but in a few days the eyes and nose begin to run, the coat stares as if the animal were cold, and although it continues to graze it gets thinner and weaker. After a while diarrhœa carries it off. Very often fine cattle in good condition perish soon after the bite from an affection of the brain. All the tissues of the animals become rotten. The mule, ass and goat do not become poisoned by the sting of the tsetse; and buffaloes, zebras, and antelopes do not suffer more from these pests than from other flies. The tsetse keeps to certain places, otherwise no cattle could exist in South Africa; and although it does not poison the antelopes, yet it sucks their blood and evidently lives upon them. Consequently, when any country infested by the fly has its game driven away, the tsetse die off.

Another insect, common in eastern Africa, is a kind of tick, and it gets between the toes or fingers, for it is not bigger than a pea. It sucks the blood until quite full, and becomes of a dark blue color. The skin, although very yielding, is so tough that no pressure will destroy the insect. After the bite there are sensations of tingling and itching which gradually ascend the limb; and the pains in the stomach commence and are accompanied with violent vomiting. Recovery is slow under these circumstances, but if these peculiar symptoms do not take place, the poison which produces them gets into the larger veins, and severe and often fatal fever sets in.

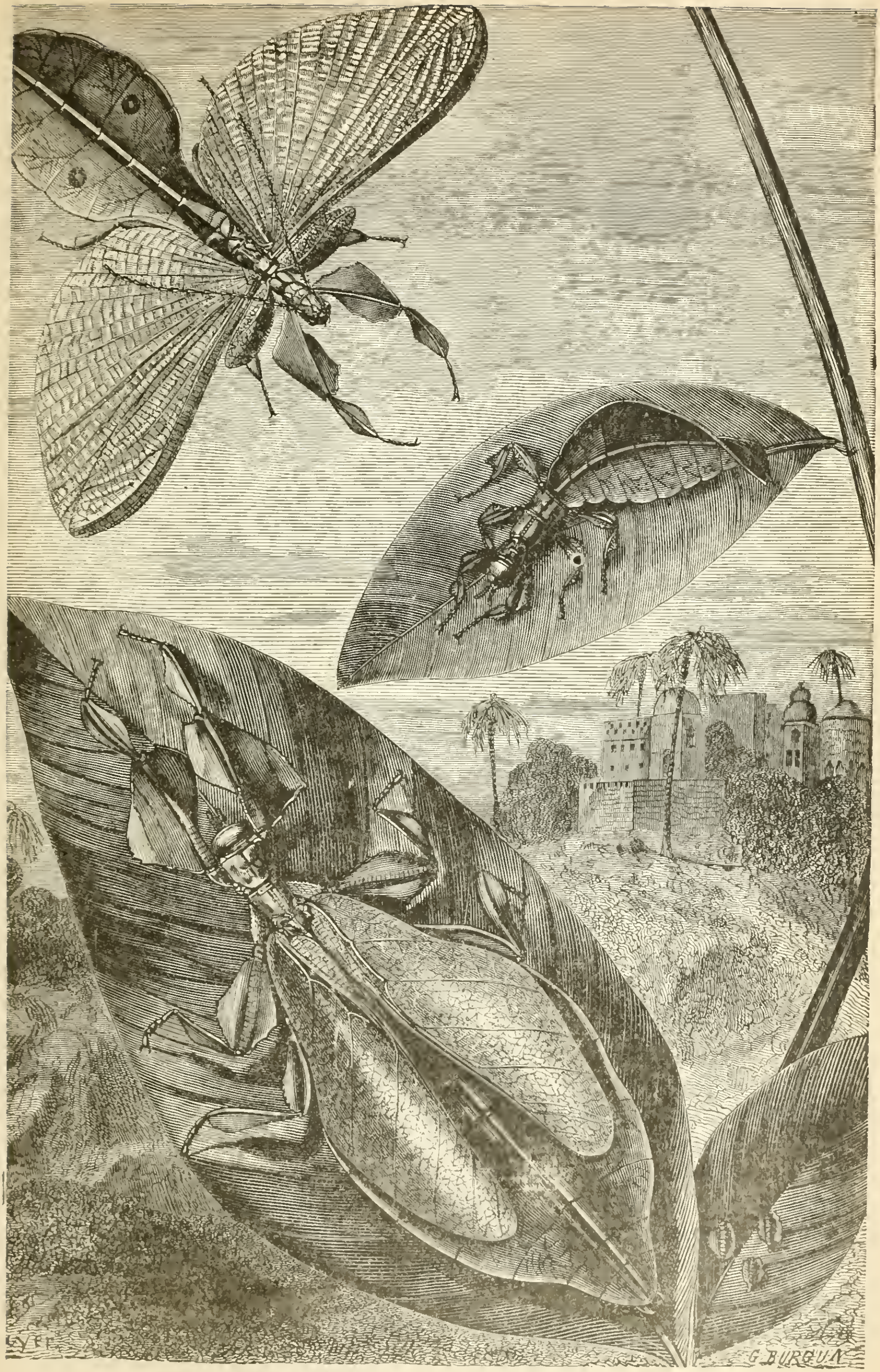
In the same districts where these ticks live there is a kind of ant, red in color, very fierce, although small, and which attacks every living thing It is very fond of meat, and when an ox is slaughtered in the neighborhood of its nests, fires of straw have to be burned all night around the carcass. They have no fear, and attack with equal ferocity the largest as well as the smallest animals. They are very useful in ridding the country of dead animal matter, and when they visit a hut they clear it completely of the destructive white ants and other vermin. Rats, mice, lizards and even large snakes surfeited from feeding fall a prey to these tiny, but numerous ants. The tsetse and this ant have a great enemy in a large, gaunt, long-legged, hornet-looking fly which is about an inch in length. It is a tiger in its way, for it springs upon the smaller insects, and after sucking their blood throws their bodies aside.

STRANGE FREAKS OF THE GAD-FLY.

If on a fine hot summer day the caterpillar which eats away all the leaves of the gooseberry bushes, leaving the stalks sticking up, is watched, a very small, black fly with a very long body, a sharp-looking tail, and long wings, will be often seen hovering about. This fly moves quickly, and finally sees the plump caterpillar. It rushes at it like a tiger, and pokes its tail under the skin of the unfortunate gooseberry-leaf eater. From that moment the caterpillar has a small egg under its skin which soon becomes a grub. The grub lives on the juices of the wretched caterpillar, and when it dies comes forth ready to attack the next generation of gooseberry-leaf eaters.

Now the same sort of occurrence has rendered the gad-fly an intolerable nuisance to horses and cattle. Nearly every quadruped, whether wild or tame, has a special gad-fly. The gad-fly of the ox is the largest, and chooses a nice, plump young ox, and alighting on its back like any other fly, close to the back-bone, it pierces the hide and lays an egg in the fine fat. The ox darts away bellowing, and if there are others near, they know what has happened, and rush away either into the bushes or into the water, where the fly cannot follow. A small swelling forms over the so-called bite, and if it is cut open a small white worm is seen. It lives on the fat, and grows until the next year. Then it has to eat its way out of the skin, and when it has done so there are plenty of starlings and other birds ready to devour it. But if it falls safely to the ground it burrows, and after living as a chrysalis, turns to the perfect fly in August.

The gad-fly of the horse has a still more wonderful life. It is often seen late in the summer very busy about horses, and if watched will be observed to dart suddenly upon some part of the hair which the horse is in the habit of licking. The fly balances itself for a moment and then deposits an egg on one of the hairs, and fixes it by a gummy secretion. Perhaps fifty or a hundred eggs are thus laid, and then the fly dies. The young worm is sometimes carried into the stomach with the food, and gives no pain to the horse. When in the stomach, it fixes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WONDERFUL WALKING LEAF.

itself to the coats by means of a set of hooks, and scoops out a little hole into which its head is plunged; and there it remains until the early part of the summer of the following year, feeding on the secretions of the stomach. It becomes an inch in length, breaks off from its hooks, and passes out with the offal. Once on the ground the grub digs down, becomes a chrysalis, and in a few weeks changes into a perfect gad-fly. By such a strange process is it brought into being.

THE SINGULAR LEAF INSECT.

Nature's curiosities abound in every part of the globe. The leaf insects are found in most very warm countries, but those from China and the East Indies are the best known. These insects are large, grotesque-looking things, uncommonly like a set of short, yellow twigs joined together by faded leaves. The limbs of the insects are long and slender, but flattened out in some places, and their bodies are either excessively slender and twig-like or are flattened and large. The color of the insect when it is alive blends so perfectly with the tints of the surrounding leaves and boughs, that a careless observer would pass it by as a part of a plant. Hence the name of the leaf-insect. The female insect has a large, flat body with fine, projecting edges, and when the wings, with their delicate lace-work markings, are folded over it, the whole looks like a crumpled and faded leaf. This appearance is increased by the flat, leaf-like expansions on the limbs, and by the curious markings on the fore part of the body, which joins the hind part just as some leaves are attached to twigs having round swellings on them. The males usually have a long and slender body, and the arms start from it just as small branches do from larger ones. They are remarkably quiet insects, and will remain perfectly still for a long time, and in very peculiar positions. The males are very pugnacious, and can be made to fight most desperately by placing them opposite each other. They lift up their bodies, and use their long arms like sabres, and squeeze and bite until one is worsted, and compelled to give up.

INSECTS PLAYING THAT THEY ARE DEAD.

Some insects are very skilful in counterfeiting death. This is a common device among spiders, moths, and various species of beetles, and varies in character according to the habits of the species. Many of the moths, when they think themselves in danger, draw their antennæ as well as their wings close to their body, and in this state they may be tossed about without manifesting the smallest sign of life or motion, as many of our readers may have observed on catching them. The common "miller moth," known to most school-boys, is a remarkable adept in this art. The small gray beetle, which makes pin-holes in old furniture, is another common example of this instinct. This little beetle has received from naturalists the title of "pertinax" from its pertinacity in counterfeiting death. A celebrated Swedish entomologist says that he has found it to equal, if not exceed, the heroic firmness of the American Indians in bearing torture. You may maim them, he asserts, pull them limb from limb, and even roast them over a slow fire, without making them move a joint, or exhibit the slightest symptom of suffering pain. Spiders, also, may be similarly tortured and maimed when they counterfeit the attitude of death. It is very common, also, with one kind of little beetles to draw in their feet and antennæ so as to give themselves the appearance of a pill, from which they take the name of pill-beetles. The common wood-louse is also well known to roll itself up in a ball when apprehensive of danger, so that only the plates which form the covering of the back are visible No doubt these plates, insignificant as they may seem, are an effectual protection to the insect against the attacks of some of its enemies. The black, purplish, shining beetle which is found on almost every road, deceives its enemies, the crows, by setting its legs as stiffly as if they were made of iron wire, and remaining perfectly motionless; and, as the crows will only eat them when alive, this stratagem is an effectual protection. That this simulation of death is not the consequence of strong convulsion caused by fear, is proved by the fact that the insect makes off with all speed the instant the object of alarm is removed; whereas, if it were a convulsive attitude, it could not resume its movements at pleasure.

CHAPTER XX.

WONDERFUL INVENTIONS.

Machine-made Birds and Animals—Jewels that Play Drums and Fiddles—the Wonderful Microscope—The Famous Printing Press—The Big Corliss Engine—The Strasburg Clock—Agricultural Machines—The Enterprising Chicken-Hatcher—A Dog Carriage—A Strange Vehicle—The Locomotive—Elegant Parlor Car—Post Office on Wheels—Ice Yacht—The Life Boat—Swimming Apparatus—Money Box—The Clock Lamp—The Two-Wheeled Steed—A Titanic Hammer.

ATTEMPTS have been made, from very early times, to imitate the motions of animals by mechanical contrivances, and some have been remarkably successful. The story of ancient writers, that Archytas constructed a pigeon that could fly, but, when once it alighted, could not resume its movement, is open to doubt; but we have better authenticated narratives of equally wonderful inventions in a later time, and in these cases their truth is absolutely certain. It is said that a German artist constructed an artificial eagle, which, on the entry of the Emperor Maximilian into Nuremberg, flew to meet him, and returning, alighted on the gate of the city to await his approach.

General De Gennes, who defended the French colony of St. Christopher, in the West India Islands, was remarkable for his great mechanical skill. Among other contrivances, he made a peacock that walked about as if alive, picked up grains of corn, and not only swallowed them, but digested them in its stomach. Wonderful as this was, its ingenuity was outdone by that of a duck made by a Frenchman named Vaucanson, which was exhibited in Paris. It was of the natural size, was clothed with feathers, and all the bones of the living object were imitated in their exact position by the mechanism of the interior. When set in motion, it performed the movements of a duck exactly. It moved its wings, ate and drank in the manner of the original, and all the usual processes of digestion were carried on in the stomach, partly by means, it is presumed, of a chemical solution. It also quacked like a duck, and is said, in drinking, to have muddled the water with its bill.

Vaucanson also constructed an automaton flute-player, which played twelve tunes, the wind issuing from its mouth in the ordinary way into a German flute, and the holes being opened and shut with its fingers. Vaucanson's flute-player has since been imitated with complete success.

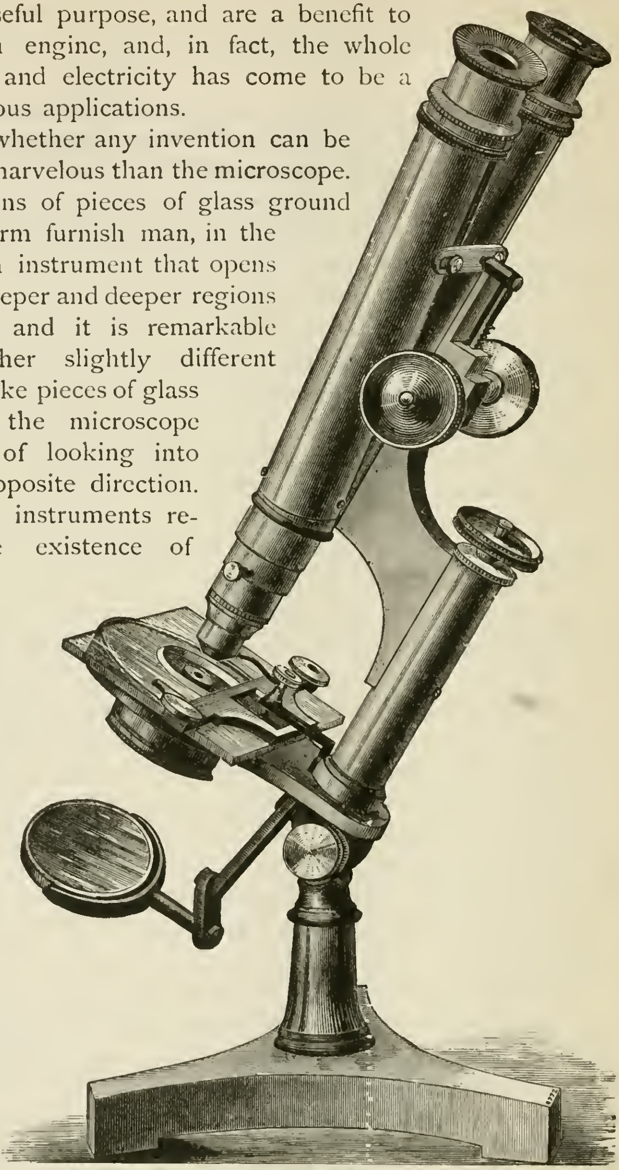
Some years ago at an exhibition of curious mechanism in London, two automaton flute-players, representing the figures of two ladies, seated, and the size of life, were playing duets in the manner of the living performer, and producing considerable variety of tone from the instruments.

Canus, the mathematician, constructed for the amusement of Louis XIV. a small coach drawn by two horses. The coachman cracked his whip, and the horses set off, drawing the coach about on a table; and when opposite the king it stopped, the page got down and opened the door, on which a lady alighted, with a curtsey presented a petition to the king, and then re-entered the carriage. The page then shut the door, the carriage proceeded, and the servant running after it jumped up behind it. The automaton coach and horses were a common street exhibition in their day. Maillardet, a noted mechanician, constructed an automaton boy, which both wrote and drew with a pencil, kneeling on one knee. When the figure began to work, an attendant dipped the pencil in ink, and adjusted the drawing-paper upon a brass tablet. Upon touching a spring, the figure proceeded to write, or to execute landscape drawings. Maillardet also constructed a magician, who answered questions inscribed in oval medallions upon a wall; one of which the spectator having selected, it was shut up in a spring drawer. The magician then rose, consulted his book, and striking the wall with his wand, two folding doors flew open, and displayed the answer to the question. The door again closed, and the drawer opened, to return the medallion. The machinery being wound up, the movements, in about an hour, answered fifty questions; and the means by which the medallions acted upon the machinery, so as to produce the proper answers to the questions, are stated to have been very simple. Maillardet also constructed other automata, including a spider made of steel, and a caterpillar, lizard, mouse, and serpent, all with their natural movements. His automatic figures, including a harpsichord player, a rope-dancer, and a singing bird, were exhibited in Spring Gardens, London.

A Parisian jeweler makes brooches and other ornaments in which mechanical movements are introduced and set in action by very small galvanic batteries, which are concealed in some part of the wearer's dress. The moving object may be a rabbit, which is made to strike a bell with drumsticks; the head of a skeleton with rolling eyes, and a mouth that opens and shuts; a grenadier beating a drum; a monkey playing a fiddle; or a bird moving its wings as if in the act of flying. The batteries are constructed of minute slips of zinc and platinum, or zinc and carbon, which act in the same manner as the larger arrangements of the same kind used for ordinary purposes. All these are mechanical curiosities. Equally wonderful are many of those inventions which serve a useful purpose, and are a benefit to man. The steam engine, and, in fact, the whole power of steam and electricity has come to be a marvel in its various applications.

It is doubtful whether any invention can be considered more marvelous than the microscope. Certain dispositions of pieces of glass ground to a lenticular form furnish man, in the telescope, with an instrument that opens to his gaze ever deeper and deeper regions of endless space, and it is remarkable that certain other slightly different arrangements of like pieces of glass supply him in the microscope with the means of looking into infinity in the opposite direction. These two noble instruments reveal to us the existence of otherwise unknown worlds—the world of the infinitely vast, and the world of the infinitely minute.

A fine comparison between the telescope and the microscope has been drawn by Chalmers. He says, speaking of the two instruments: The one led me to see a system in every star. The other leads me to see a world in every atom. The one taught me that this mighty globe, with the whole burden of its people and of its countries is but a grain of sand on the high field of



THE MARVELOUS MICROSCOPE.

immensity. The other teaches me that every grain of sand may harbor within it the tribes and families of a busy population. The one told me of the insignificance of the world I tread upon. The other redeems it from all its insignificance; for it tells me that in the leaves of every forest, in the flowers of every garden, and in the waters of every rivulet, there are worlds teeming with life, and numberless as are the glories of the firmament. The one has suggested to me, that beyond and above all that is visible to man, there may be fields of creation which sweep immeasurably along, and carry the impress of the Almighty's hand to the remotest scenes of the universe. The other suggests to me that within and beneath all the minuteness which the aided eye of man has been able to explore, there may be a region of invisibles; and that, could we draw aside the mysterious curtain which shrouds it from our senses, we might there see a theatre of as many wonders as astronomy has unfolded, a universe within the compass of a point so small as to elude all the powers of the microscope, but where the wonder-working God finds room for the exercise of all His attributes, where He can raise another mechanism of worlds, and fill and animate them with all the evidence of His glory.

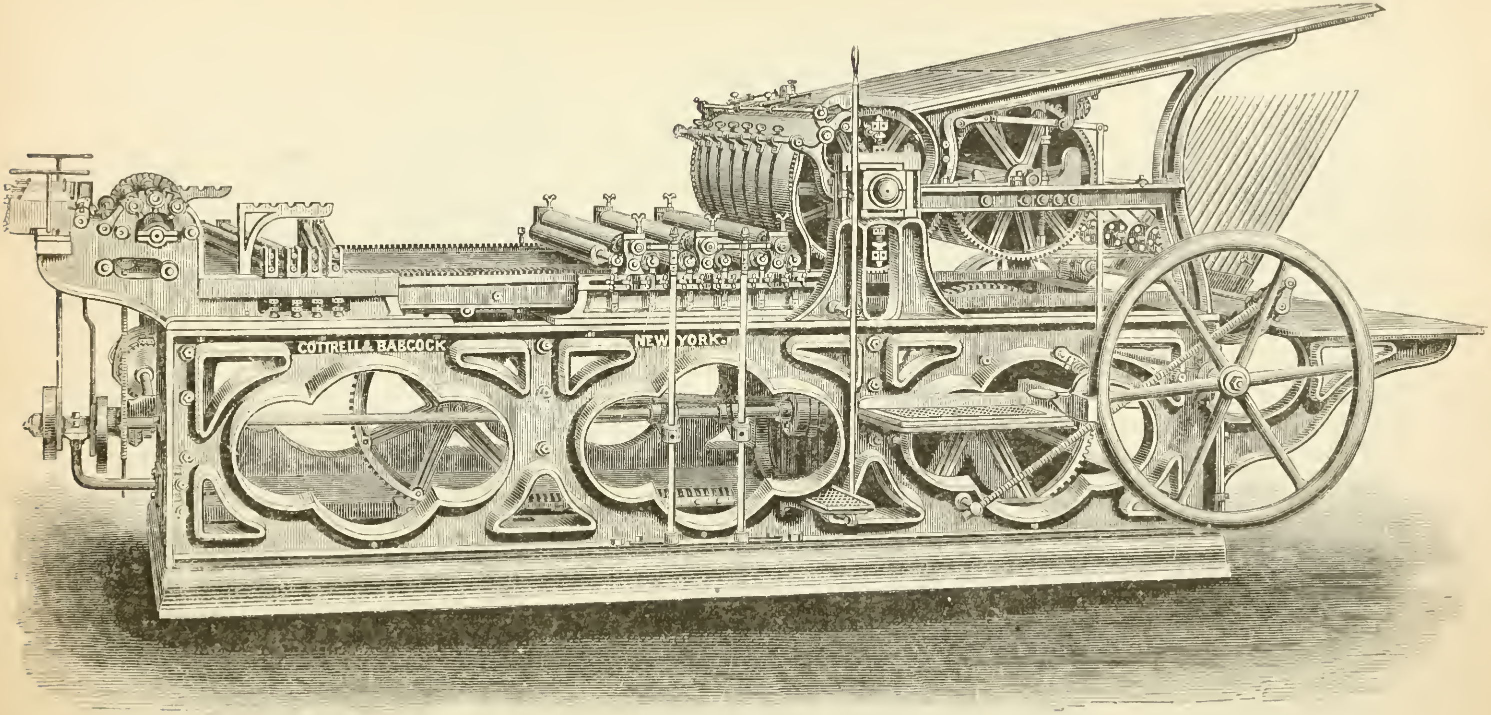
Microscopes are of two kinds—simple, consisting of a single lens; and compound, consisting of a combination of lenses. No name or period can be associated with the invention of the simple microscope, for a knowledge of the magnifying power of convex transparent bodies must have existed even in the remotest antiquity. No one who has ever observed with any degree of attention a drop of dew or rain on the surface of a green leaf, could be ignorant of the magnifying effect of the transparent globule. There are other numberless instances in which transparent spherules of various materials are formed by nature or by art, and of which the optical property in question could not fail to have attracted attention. Of course such casual observations must be considered as very different from that systematic use of spherical or lenticular transparent bodies in the examination of minute objects, which would entitle the person who first made them to the honor of having invented the simple microscope.

That such microscopes must have been known to the ancients, the excessively minute work on some of the engraved gems which have been preserved to us, seems to exclusively prove, for some of the work is invisible to the unassisted eye. Indeed, Mr. Layard found among some glass vessels, in the ruins of Nineveh, a lenticular shaped piece of rock crystal, which must have been formed expressly for optical purposes. Again, from passages in certain ancient authors, it would appear that glass globules or globular vessels filled with water were known as "burning-glasses," and also for their magnifying properties.

Some of the inventions connected with printing are fitted to excite the utmost admiration. Here the genius of the human mind has been specially displayed. It is hard to say when this "noble craft and mystery" did not exist: whether an impression be made by pressure of the hand upon snow, or by wood or metal upon paper or vellum, it is alike printing; and one of our recent discoveries, producing an impression of a fern, is called Nature-printing. Nearly four thousand years ago, seals were impressed upon soft material: next, characters were stamped upon clay in forming bricks, as in Babylon; of which art examples have been brought from Egypt and from the buried cities of Asia. Besides these inscribed bricks, have been found the wooden stamps. Brass or bronze stamps, with raised characters, with a handle at the back, for printing with color upon papyrus, linen or parchment, have also been found; the process resembling that of stamping linen with marking-ink in our day. The Romans used the above stamps, and it is strange that they did not engrave sentences upon blocks, and transfer them to surfaces, to save the slow operation of copying manuscripts. The Chinese claim to have printed from blocks several centuries before it was practised in Europe, or fifty years before the Christian era. Next, printing from pictures engraved upon wooden blocks, was accomplished in the thirteenth century; then playing cards were taken from blocks by means of a burnisher, as engravers on wood take impressions on India paper in the present day; and next, the engravings of the Poor Man's Bible, with the text printed in from moveable types.

Various machines for making the impression of the type on paper were constructed, and various improvements made from time to time. König, an ingenious German, invented a machine with a view to utilizing steam-power. He turned his attention to cylindrical machine printing, and at length produced a machine capable of working one thousand impressions per hour, and requiring only the superintendence of two boys. It was then considered practicable to extend the principles and capabilities of this machine to printing a newspaper. König obtained a contract with the proprietor of the London *Times* newspaper, for two large machines to print his journal; and on the twenty-eighth of November, 1814, the readers of the *Times* were informed that they were, for the first time, perusing a newspaper printed by the application of steam-power, and working eleven hundred impressions per hour. The ordinary type was used and laid upon a flat surface, and the impression was given by the form passing under a cylinder of great size.

These machines were necessarily of a very complicated construction,


COTTRELL & BABCOCK
NEW YORK.

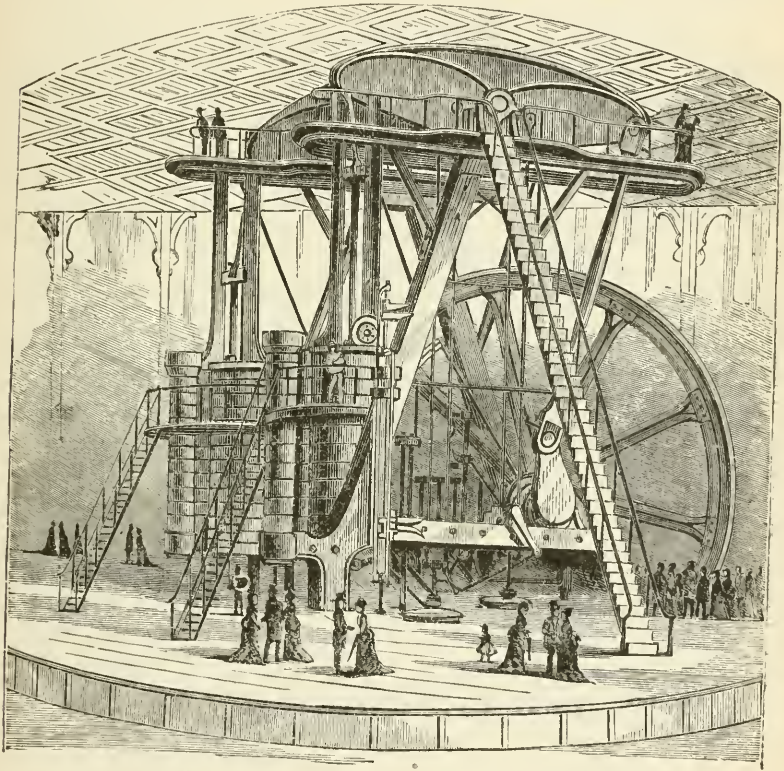
THE WONDERFUL STOP CYLINDER PRINTING PRESS.

and it may suffice to say that each consisted of a number of cylinders, which so revolved as to carry the sheets of paper, through the agency of a number of tapes and wheels, placed between them and the types on the surface of the table, which constantly moved backwards and forwards, receiving in turn the ink from the inking rollers, and impressing its form on the paper. Each machine was only capable of printing one side of the newspaper, and the sheets thus half printed by the one were perfected by the other. These machines were greatly simplified by Messrs. Applegath and Cowper, this being the first really useful machine: its principal improvement consisting in the application of two drums between the impression-cylinders, one of which reverses the sheet, and the other secures the register (that is, one page falling precisely on the back of another), by retaining it after the impression of the first form, just so long that it may pass on to the second cylinder in exact time to be impressed thereby upon the second form; and of the distribution of the ink upon a plane surface, instead of by a number of rollers, by which König's endless tapes and vertical rollers in rapid motion convey it round the printing cylinders, each of which always touches the type at the same corresponding point, the surfaces moving with a great velocity.

No description can give any adequate idea of the scene presented by one of these machines in full work,—the maze of wheels and rollers, the intricate lines of swift-moving tapes, the flight of sheets and the din of machinery. The central drum moves at the rate of six feet per second, or one revolution in three seconds; the impression cylinder makes five revolutions in the same time. The layer-on delivers two sheets every five seconds, consequently fifteen sheets are printed in that brief space. Messrs. Hoe, of New York, have constructed machines in which the type is fixed on the central cylinder, which has a continuous or rotatory motion, in contact with the impression cylinder, set around it. One of these machines with ten cylinders can turn out twenty thousand impressions in an hour. For book printing, the machine built by Cottrell and Babcock has a high repute. It is a marvel of mechanical genius, and works with remarkable speed and precision. It will be interesting to our readers to know that the many thousands of copies of this book which have been placed before the public to meet the wide demand, have been printed upon these marvelous machines.

A wonderful engine was that which moved all the vast and complicated machinery in our great Centennial Exhibition. No fires or furnaces were allowed in Machinery Hall. The boilers of the great Corliss engine were placed in a separate building, and steam was introduced into the hall by a service of pipes.

The motive power for all the machinery in motion in this vast hall was a double-acting duplex vertical engine. It stood in the centre of the hall, and was built upon a platform fifty-six feet in diameter, and three and one-half feet above the floor of the hall. The engine rose to a height of forty feet above the platform, and was the most conspicuous object in the hall. It had cylinders of forty-four inches in diameter and ten feet stroke, the peculiar variable cut-off arrangement being actuated by the governor, as common in the Corliss engines. Between the vertical engines was a fly-wheel of fifty-six tons weight, thirty feet in diameter and twenty-four inch face; it made thirty-six revolutions per minute, the rate being kept equal by means of the governor cut-off, which immediately responded to any change in duty, owing to the throwing off or on of machines either singly or embraced in a whole section of the building, The tubular boilers were twenty in number, in a separate building, and each represented a nominal power of seventy horses, the work of the engine at sixty pounds pressure being about



THE IMMENSE CORLISS ENGINE, CENTENNIAL EXHIBITION.

fourteen hundred horse-power. The fly-wheel had cogs on its periphery, which matched with cogs on a pinion which rotated a line of underground shafting, and this, by means of mitre-gearing, rotated other underground shafts, so that motion was communicated to eight points in the ground-plan at the transept, at which were pulleys from which belts rose through the floor and thence passed around primary pulleys on the eight principal lines of shafting, which reached from the transept to the extremities of the east and west ends of the building. The sunk shafting, its mitre-gears, pillow-blocks and pulleys, weighed two hundred tons, and these were found fully equal to the immense demand.

Eight main lines of shafting were provided for the machinery in the avenues and aisles, the larger portion being speeded to one hundred and twenty revolutions per minute, and one line to two hundred and forty revolutions per minute, principally for the wood-working machines. With the subsidiary lines, the length of shafting was estimated at ten thousand four hundred feet, each main line of six hundred and fifty feet transmitting one hundred and eighty horse-power to the various machines connected with it, and working with mathematical precision.

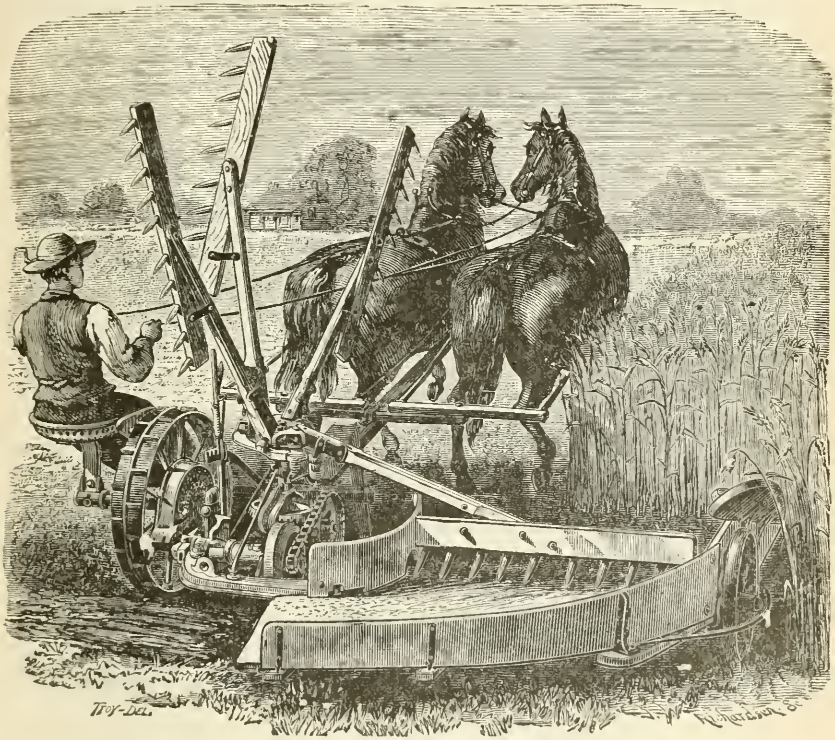
THE WONDERFUL CLOCK AT STRASBURG.

About the middle of the fourteenth century the canon of Strasburg wished mightily for a clock which should be worthy of the magnificent cathedral wherein he would place it. With this end in view, he invited the most learned astronomers and the most skillful mechanicians to vie with each other in producing a clock which should astonish the world, and be no shame to the mighty cathedral. A man came forward; and in 1352 the clock was finished.

The whole of the Chapter was convoked to behold the first movements of this marvelous machine, which surpassed the most sanguine expectations. A cock, perched at the top of a tower, flapped his wings a few minutes before the striking of each hour, to warn the faithful against the suggestions of that evil spirit, which the chief of the Apostles himself had no power to resist. Then Death came, and struck upon a sounding bell as many strokes as the hour required, and an equal number of Apostles passed in a lowly attitude before Christ, who placed his hands upon them in the attitude of blessing. Finally, the chariot of the sun showed by its course round the dial the months and the seasons, and the hands pointed out the different parts of the day, the days of the week, the days of the month, the age of the world and the year of our Lord.

The present clock was commenced by a clever artist of Strasburg, M. Schineque, in June, 1838, and finished in October, 1842. The central motive power, which is in itself a clock of wonderful precision.

serves to indicate upon a dial-plate, placed on the outside of the church, the hours and their subdivisions, and the days of the week, with the signs of the planets corresponding to them. These indications are repeated inside upon a double dial, one showing the hours, and another devoted exclusively to the calendar, showing the month, the date, the Dominical letter, and the saint's day. Two winged beings are seated on each side of the small dial. At each quarter of an hour the right hand one strikes upon a bell. Immediately the stroke is repeated on all the dials by automata, one representing Childhood, one Youth, another Manhood, and a fourth Old Age. Death, placed upon a pedestal by the side of the Old Man, strikes the hours, and every time he fulfils this grave mission the second of the two winged figures of which we have spoken, reverses an hour glass.


Troy-Del.
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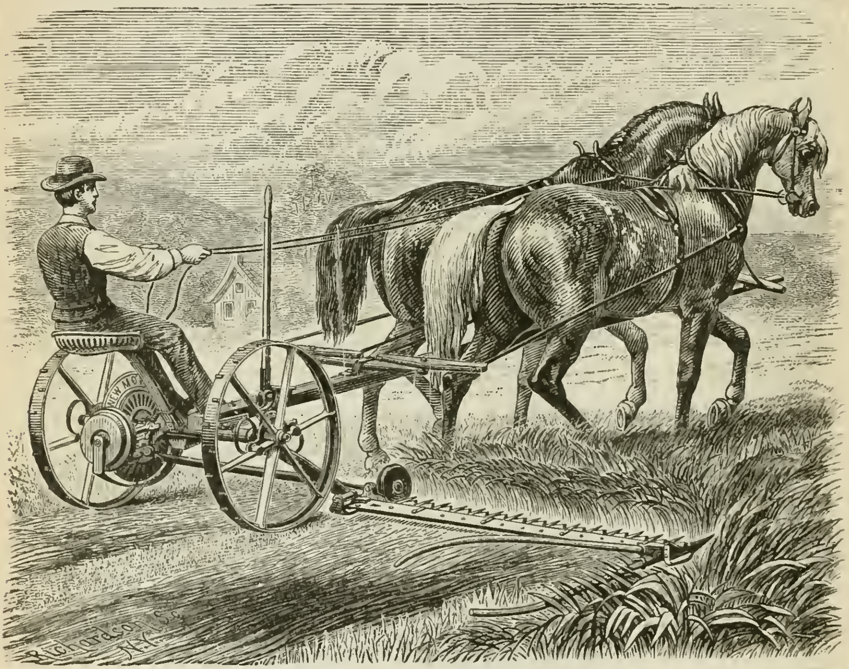
THE WONDERFUL LABOR-SAVING REAPER AT WORK.

At mid-day, at the striking of the hour, a procession of Apostles passes before Christ, who places his hands over them in the attitude of blessing; at the same time, the cock perched on a tower flaps his wings and crows thrice. On the ground, in front of the clock, stands a celestial globe, demonstrating the daily and annual motions of the heavens, stars and planets, with great exactness.

In no department of inventions have greater strides been made in the last few years than in that of agricultural implements. There is now a machine for almost every kind of work. Reaping and mowing machines have greatly lessened the labor of gathering the hay and grain.

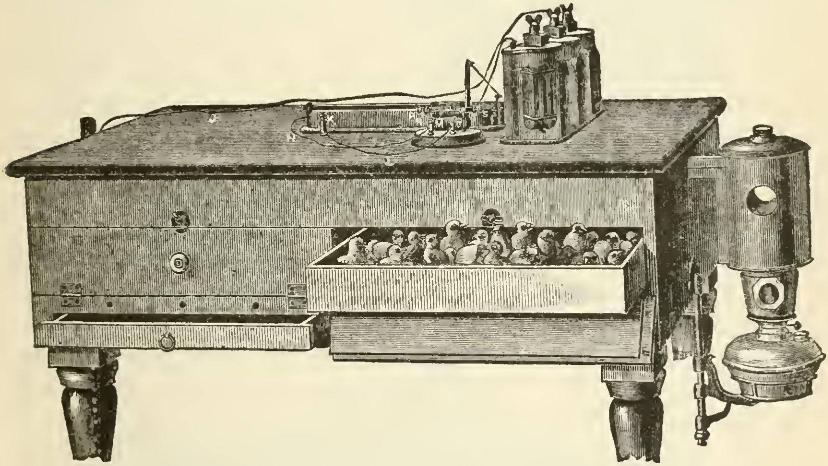
The Buckeye Mower has a tubular iron frame of great strength and simplicity, which is made in one piece, and dispenses almost entirely with bolts. All openings for the shaft bearings are bored simultaneously by special machinery, and an absolute accuracy in position and line is attained. The gearing is compact and thoroughly protected. It is all placed at the corner of the machine which is furthest removed from the cutting apparatus. Shafts and gears are always in the same level position, unaffected by any movements of the cutting apparatus, and the motion given to the knives is of an unvarying regularity.



THE FAMOUS BUCKEYE MOWER AT WORK.

The mower has a light cutting apparatus and a three-inch knife section. The guard fingers are of malleable iron. The cutter bar is attached to the frame of the machine by a wrought iron coupling piece, hinged at both ends, and adapts itself to all varieties of surface, independent of the movements of the frame. In addition to the coupling piece, a wrought iron brace holds the forward end of the inside shoe firmly, and protects the connecting rod; and a diagonal brace extends to the rear end of the machine, where it is hinged in line with the inner joint of the coupling piece. At the bar the extreme points of the hinge measure some twelve inches, at the frame they are above two feet apart. These long hinges support the cutter bar level on the leading wheel, and prevent any sagging back at its outer end.

Not only can grass and grain be cut by machinery but even chickens can be hatched on the same principle. The ancient Egyptians hatched and raised chickens successfully by artificial means, but in our day and generation all such attempts have, until within the past few years, proved failures, or at best but partial successes. The first incubators offered to the public in this country were not practical enough to meet the wants of poultry raisers, but the demand for an incubator that would "beat the old hen" was so great that inventive genius was stimulated, and as a result there are at present some half a dozen different kinds of incubators that will—if the manufacturer's directions are carefully and intelligently followed—hatch a larger per cent. of the fertile eggs than the hens. These incubators are rapidly coming into use, and the time is not far distant when no poultry raiser who wishes to raise over two or three hundred early chicks will consider his outfit complete without one or more incubators.



THE PATENT HEN AND ITS WONDERFUL BROOD.

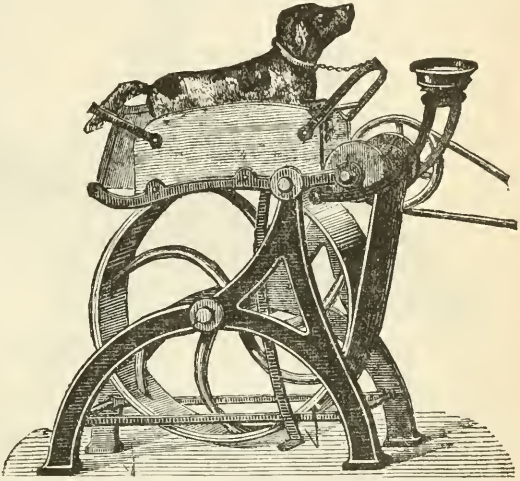
The principle of the incubator is very simple. Eggs will hatch without the services of any mother-hen if they are kept at a certain temperature. The plan of the incubator admits of a side lamp which furnishes heat to the hatching chamber. This can be regulated, and the process of getting the chicks can be carried on more evenly than in the case of a hen that is compelled occasionally to leave her nest for food.

The advantages to be derived from the use of a good incubator are many. In the first place, one can set a large number at any desired time without waiting for sitting hens, and this is a matter of prime importance to poultry raisers who desire to raise any considerable number of early broilers for market. Next, there is an actual saving of time and money—it requiring very much less time to care for three hundred eggs in a self-regulating incubator than it would to care for twenty-five or thirty sitting hens that would be required to hatch the same number of eggs the natural way; and the cost of running the incubator is more than balanced by the cost of food necessary for the number of hens that would be required to do the same amount of work. We would also call attention to the fact that incubator chicks are always free from lice to begin with, and incubators don't trample the life out of chicks before they get fairly out of the shell.

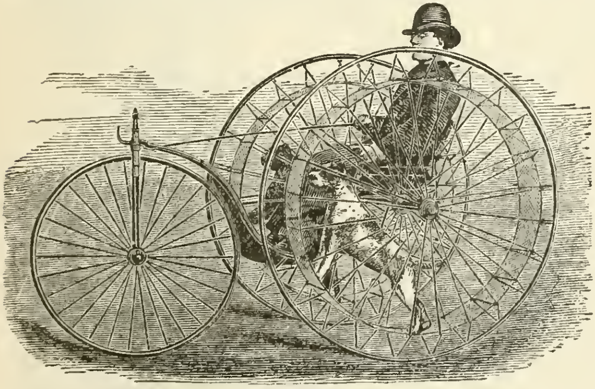
Incubator chicks that break the shell promptly on the twentieth, twenty-first, or even the twenty-second day (they will be out on time if the temperature has been kept right), are just as strong and healthy in every way, and—if properly cared for after hatching—no more liable to die off "sudden like," without any apparent cause than those hatched in the natural way.

Although the incubator that eats no corn and scratches no garden beds is such a success, yet domestic animals are good in their place. They have been employed for all time to draw carriages and the plough. But these animal motors are usually employed under defective conditions, and therefore without full profit. The inert mass of the animal remains quite unutilized, his force only is used, and there are more objections on the score of humanity as well as from a mechanical stand-point. and great muscular tension with suffering may be inflicted upon the animal which is continually mounting a wheel, or some contrivance for raising water. There was in the Paris Exhibition a threshing machine, put in motion by a horse walking up on a pair of rollers, which constituted an "endless" way, and we will now briefly describe a machine which utilizes animal force and weight. It is the invention of Mr. Richard, of Paris, who has made many mechanical apparatuses for industrial purposes.

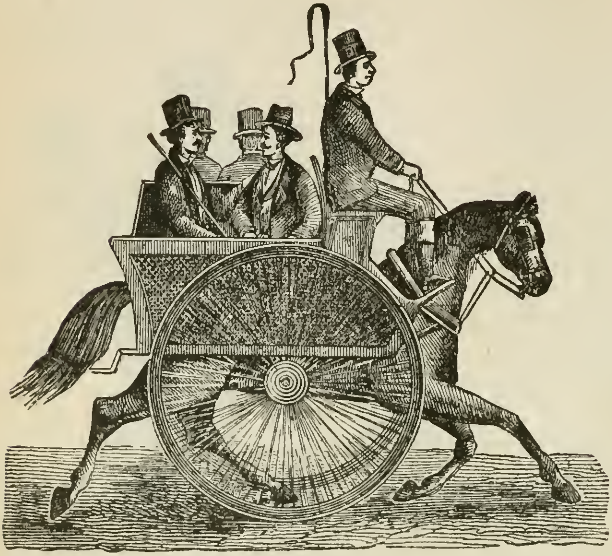
The principle of the invention consists in the animal utilizing all the force resulting from the dead weight. A small box contains the dog very easily. In the illustrtaion we see the dog at rest, and in that case maintains his centre of gravity and exercises no force upon the wheel. But when the box is inclined, the mere weight of the animal is sufficient merely to turn the wheel. The dog, finding himself sliding away, naturally endeavors to move forward, and the rotation of the wheel is continued; the best results are obtained when the body is placed entirely upon the descending line, and the result is owing only to the weight of the animal. There is a resting place just above and outside the "endless" way traversed by the dog. A basin with water is also provided for the animal.


MACHINE FOR UTILIZING DOG POWER.

In our Centennial Exhibition there was a singular contrivance for utilizing the weight and strength of dogs. It consisted of a three-wheeled vehicle, in which a single person could sit, and have his motive power on each side of him. Just as a squirrel springs up on a movable wheel and sets it whirling by its weight, so the dogs apply their power, and all the rider has to do is to guide his singular conveyance.

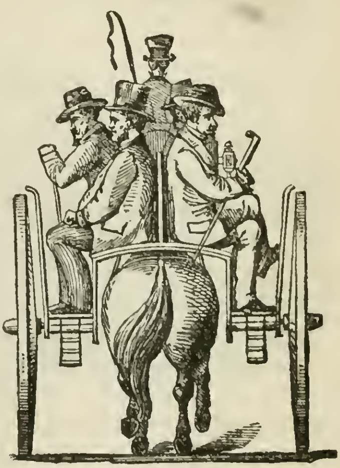

A CARRIAGE PROPELLED BY DOGS.

More frequently horses form the motive power on the road. Here is a very curious vehicle, also shown in the Centennial Exhibition, and the explanation of it we give in the words of the anonymous inventor: My vehicle will carry four persons without counting the driver. It is strong, easy to draw and can turn in a horse's length. The driver completely controls the animal, and no dust is thrown up to inconvenience the sitters, for by the time it rises the car is well in advance of it. It is cheap, the harness is simple and safe. The horse is sheltered from heat and rain and flies. If he should fall, there is no more danger to life and limb than there would be if he fell in a carriage; and last of all, no very showy animal is needed, so long as his wind is sound, and his legs and tail respectable. Travelers in this "trap" can sit in any position, back to back, or face to face, two and two. The weight is all near the collar, and the animal is under control most perfectly.



A UNIQUE VEHICLE.

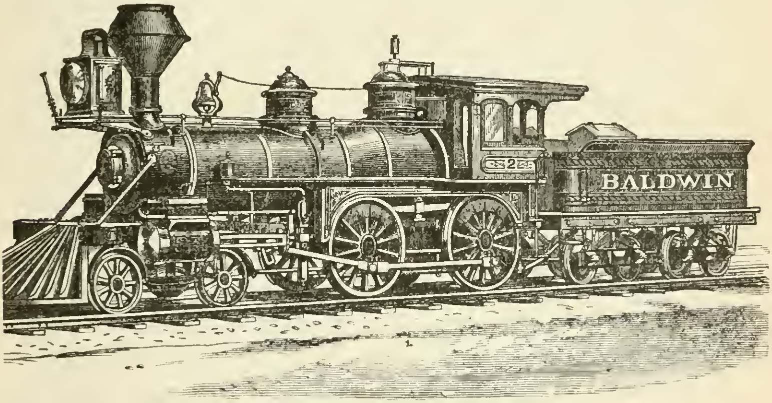
But dogs and horses are not swift enough for our hurrying age, and we have a much faster mode of conveyance. Whenever the history of our time is written, the invention of the railway and the locomotive steam-engine will furnish its most important and interesting chapter. Its benefits are more universally diffused than any other; nearly every man, woman, and child, participates in the profit and practical comfort, and even luxury, to be enjoyed by means of the railway and its engine. All ages share its physical completeness in conveying us without energy or effort from place to place, and contributing to convenience and enjoyment in a more direct manner than any other result of human ingenuity. It is the universal messenger of life, and is more tributary to the enjoyment of all classes than any other contrivance to be named: its iron roads are the very arteries of our existence as a commercial and manufacturing community, and they largely increase our pleasures, by



END VIEW OF VEHICLE.

the delightful change of scene which they bring within the reach of all grades of the community.

In 1784, Watt patented a locomotive carriage; and in the same year his friend and assistant, Murdoch, constructed a non-condensing steam locomotive of lilliputian dimensions. This locomotive was placed on three wheels; the boiler was of copper; the flue passed obliquely through it, and was heated by a spirit-lamp; the steam cylinder was only three-fourths of an inch in diameter, with a stroke of two inches turning a crank on the axle of the larger wheels, which were nine and a half inches high. This little locomotive, standing not higher than fifteen inches above the ground, could run at a speed of six or eight miles per hour. This model is interesting, inasmuch as it was the first ever made by an Englishman, preceding that by Trevithick by many years. It is to be seen at South Kensington, in the Patent Museum. Here also is a small model of a locomotive intended for the common road, patented in 1802 by Richard Trevithick and Andrew Vivian. This was supposed to be the first model in existence of a locomotive. But in the Museum of the Patent-office at Paris, there is a model of a locomotive of long prior date; and in an adjoining church, now appropriated as a kind of hospital for old decayed engines, is the original locomotive that actually ran upon the road, but in doing so killed a man, and subjected the inventor to imprisonment.



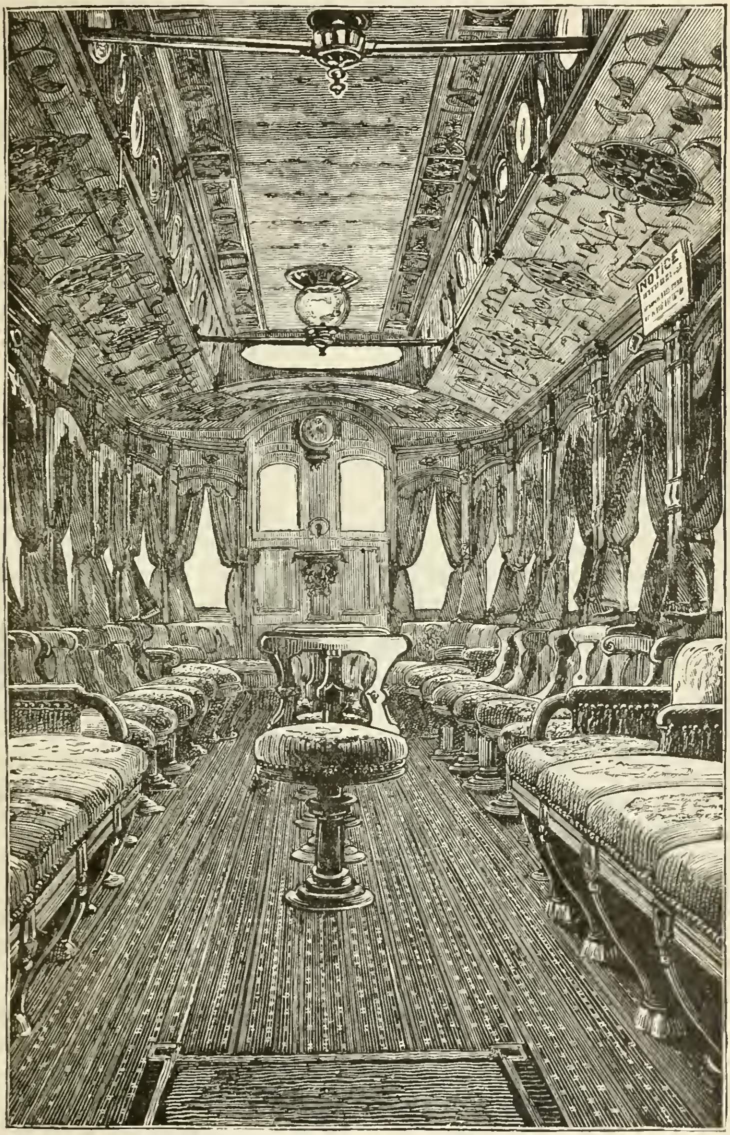
THE STEAM LOCOMOTIVE.

The first railway constructed in the United States was a line of about four miles for the conveyance of granite from the quarries at Irving to Boston harbor, which was first opened in 1827. The successful introduction of steam locomotion in England was followed by the formation of numerous important lines in America; and in 1839, more than three thousand miles were completed in the United States. Cheapness of land and timber made the average cost greatly below that of English railways; the cost of several lines did not reach twenty-five thousand dollars per mile. The practice, after having passed through various phases, has arrived at two great types of locomotive for passengers and for goods traffic, which are universally adopted in this country. The passenger-locomotive has eight wheels, of which four in front are placed in a moveable frame, called a truck, which swivels on a central pivot, and adapts itself to the curves of the lines; the four wheels behind are the drivers; they are larger than the front wheels, and of equal size and coupled. The cylinders are placed outside, just over the truck, horizontally.

Until recently the highest railway in the world was in Chili, attaining an elevation of four thousand and seventy-five feet above the sea level —a less height, of course, than that to which Trevithick worked the stationary engine in Pasco, but said to be one thousand feet higher than any other locomotive has reached except on our great Pacific road. These summit levels teach engineers greater daring; and the Alps, Cordilleras and Ghauts, even the mighty Himalaya itself, will no longer be considered bounds to the railway system. Amongst the more prominent railway works are bridges of enormous span. The widest single span of any railway bridge in the world is twelve hundred and twenty-four feet, carrying the Lexington and Danville Railway, at an elevation of three hundred feet, over the Kentucky River. The next widest span is that of the Niagara suspension bridge, connecting the American and Canadian railways at Niagara Falls; the clear span is eight hundred and twenty-two feet.

Not only does the wonderful machinery invented in recent years admit of a high rate of speed, but inventive genius has taxed itself to provide for the comfort and convenience of travelers. Over our great Pacific thoroughfare passengers eat, drink and sleep on the train, and have every acommodation that could be furnished by a first-class hotel. They can also ride in parlor cars, fitted as elegantly as the drawing-room of a lord or lady. Finest upholstery, easy chairs, restful sofas, electric lights, are among the striking features of our railroad traveling.

With regard to the question as to which is the longest and which the highest railway in the world, it may be stated that the Union Pacific line, from Omaha to Ogden, a distance of ten hundred and thirty-two miles, bears the palm for length. This line has been, within the last few years, supplemented by another—the Central Pacific—which carries the communication from Ogden to San Francisco, a further distance of eight hundred and eighty miles; so that a person may travel in one and the same carriage completely across our continent, from ocean to ocean. The whole distance from New York to San Francisco is three thousand two hundred and fifteen miles, and the journey occupies a week, the trains traveling night and day. The line between Omaha and San Francisco traverses some extraordinary scenery of wild and

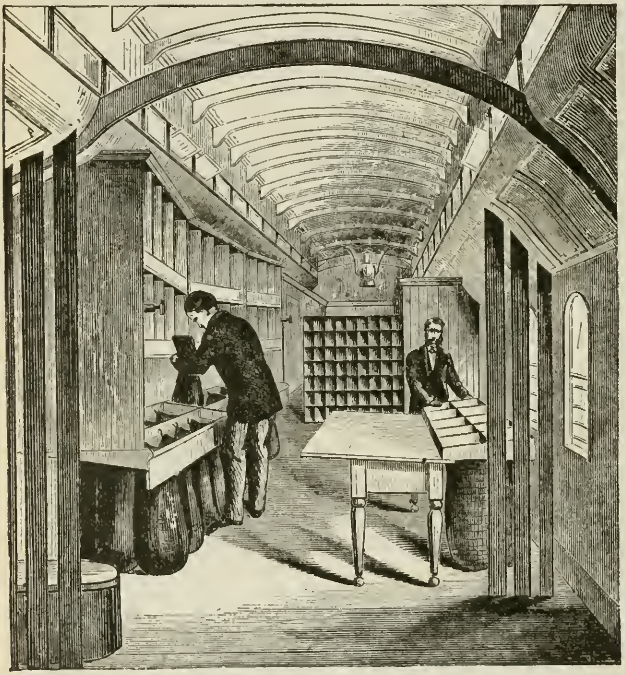


ELEGANT INTERIOR OF A PARLOR CAR.

varieo character. At one point the line crosses the Black Hills at an elevation above the sea-level of eight thousand two hundred and forty-two feet; and this is probably the greatest elevation yet reached by any railway.

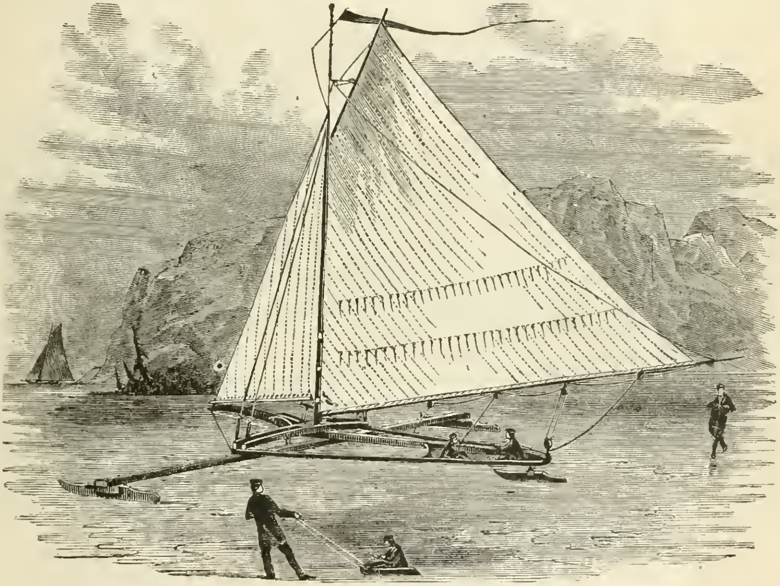
On all our great roads the postal car is an institution. While the train may be flying at the rate of sixty miles an hour, the mail is assorted, and the pouches are made ready to be dropped at various points. sending their messages in all directions.

There is another conveyance which must be ranked among the wonderful modes of transportation that have astonished the world in recent times. Yachts are constructed not only for sailing in water, but also on ice. The ice-yacht is a sloop, with one mast, one large sail, and generally a smaller one, a framework on runners, and a boat connected with it for the accommodation of the travelers. The sails are worked as in an ordinary sail-boat, and the wind propels the craft over the smooth ice, sometimes with incredible velocity. This is a unique contrivance, and a mode of conveyance quite marvelous in its way, but requiring much skill for its management.



A TRAVELING POST-OFFICE.

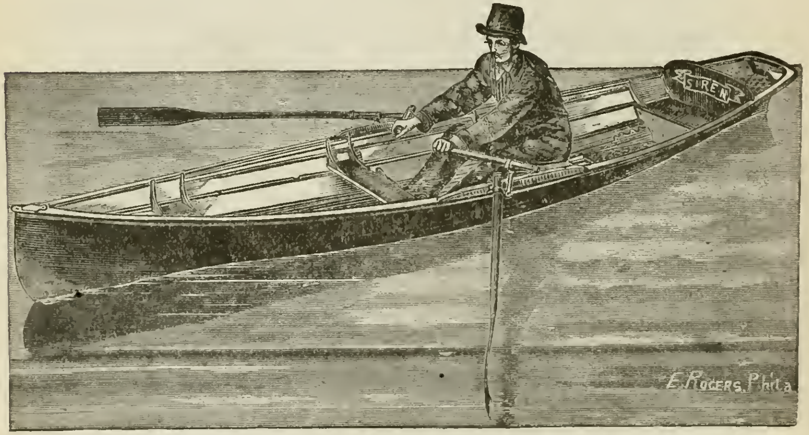
Conveyances that need the water as their element are among the ingenious inventions which are well worth our examination. Among the most prominent of these must be placed the lifeboat, which is equal to the roughest sea, and by reason of its marvelous construction has been the savior of multitudes of the imperiled. In our great exhibition the general characteristics of the lifeboat took for their common principle of buoyancy, the construction of an air-tight lining in the interior of the boat—the space between the outward and inward sides gradually widening until a very broad gunwale was formed. In other specimens the air-tight cell was placed lower, running in the form of a square or circular box round the boat, but beneath the seats. A few specimens were fitted with cork belts or furnishings, which keep the boat nearly as buoyant as air-tight tanks would do; and certainly have the additional advantage of not being rendered useless by an accidental blow from the sea against the wreck. The danger, however, is sought to be guarded against by the construction of several air-tight compartments—any of which, we are assured, would suffice to keep the boat, with her crew, above water. The long, shallow shape of the boats was universal; and they were constructed alike at stem and stern, so as to avoid the dangerous necessity of going about. One boat was furnished with outriggers, supporting nets, into which people might leap from a ship, while the boat was kept at such a distance as to diminish the risk of her being swamped against the wreck. Others had their buoyant apparatus in the sides beneath the seats; the oars double banked; and beside every man a pump for getting rid of the sea when it filled the boat.



THE WONDERFUL ICE YACHT.

A lifeboat was recently experimented with on our coast: manned by thirteen persons, she was put to sea, was filled by a bucket with water, and set sail. The weight of water had no effect upon the boat, she maintained her position; the crew then endeavored by every means to sink her, but in vain. The boat was then pitched off the pier into the sea, but instantaneously righted, and relieved herself of water; she was then turned over keel upwards, but turned into her proper position immediately. The expanding tubular life-raft is formed of vulcanized India-rubber tubes, inclosed in canvas cases or nettings, lashed to cross spars, so as to form, when extended, a contrivance for floating on the water, or being rowed like a boat, in safety through a surf or heavy sea. There is also a collapsing boat, consisting of tubes lashed round a boat-like framework, with three thwarts which shut up like a purse. The bottom is formed of nettings to enable the water to have a free course, and the thwarts are kept expanded by means of "moveable fishes." This boat will float safely in the roughest sea.

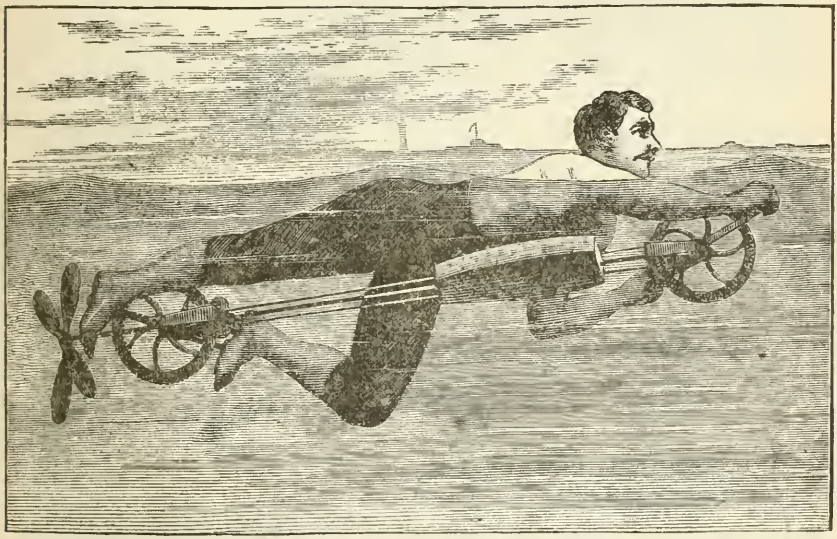
One of the very convenient inventions now coming into use is an oar-lock with a reverse action. By this ingenious contrivance the oarsman can sit with his face to the bow, can see exactly where he is going, and guide his skiff accordingly. Thus there are wonderful inventions for traveling by water, but now we have to mention a novel means of swimming, which may prove useful to those who distrust the natural buoyancy of water, and their own power of keeping afloat or swimming. The simple apparatus is the invention of a citizen of Alabama. The machine consists essentially of a shaft, upon which a float is fixed, and at the end of the shaft is a small screw propeller. The shaft is put in motion by a wheel arrangement worked by the hands, and by a crank worked by the feet. The swimmer rests upon the float, with his head well above water. The float sustains him, while the propeller forces him through the water without his feeling fatigued, at the rate of about five miles an hour.



THE REVERSE OAR-LOCK—THE ROWER FACING THE BOW.

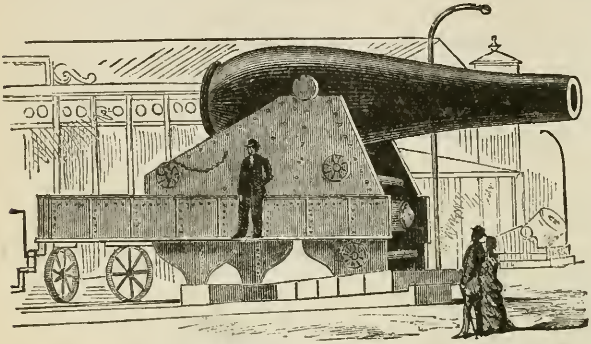
It is a pity to be compelled to state that modern inventions have greatly increased the destructiveness of implements of war. Krupp's fifteen inch rifled breech-loading gun is entirely made of steel, in three principal parts—the inner tube which extends from end to end of the piece, and two layers of superimposed steel hoops. Considered as a grand mass of worked metal nothing can be finer than this huge monster. The weight of the huge gun is, roughly, fifty tons, and the weight of the projectile is upwards of half a ton. The charge weighs about a hundred pounds, and forms a terrific explosive.

For actual perforation of iron-plated targets of modern construction heavy guns are required, and as these must be capable of throwing a projectile with a high velocity, they must be strong enough to stand large charges of powder The projectiles must be of hard material. The resistance of wrought-iron plates equally well made varies as the square of their thickness. Placing them at an angle to the line of fire diminishes the effect of the shot in the proportion of the sine of the angle of incidence to unity. The resistance of plates to perforation is hardly affected by a backing of wood simply, but much increased by a rigid backing of iron combined with wood, or of granite, iron, brick, much of the shot's effect being transferred to the backing, which suffers proportionately.



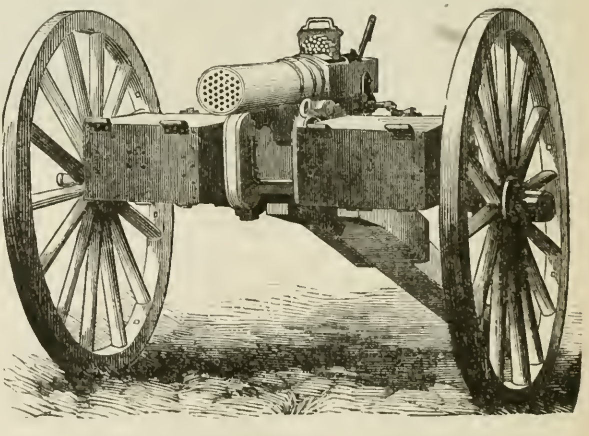
THE MARVELOUS SWIMMING MACHINE.

Among the new weapons must be mentioned that of which so much was heard at the commencement of the Franco-Prussian war under the name of mitrailleuse. It was a battery of rifles united in one machine, and the details of the construction were at first kept concealed. Weapons on the same principle have since been added to the armament of other nations. The Gatling gun has ten distinct and separate barrels, which are screwed into a solid revolving piece at the breech end, and near their muzzles pass through a circular plate, by which they are kept parallel to each other. The weapon is made of three sizes, the largest firing half pound bullets, one inch in diameter, and the smallest bullets about half an inch in diameter. The small Gatling is said to be effective at a range of more than a mile and a quarter, and it can discharge four hundred bullets in one minute, constituting a very destructive weapon.



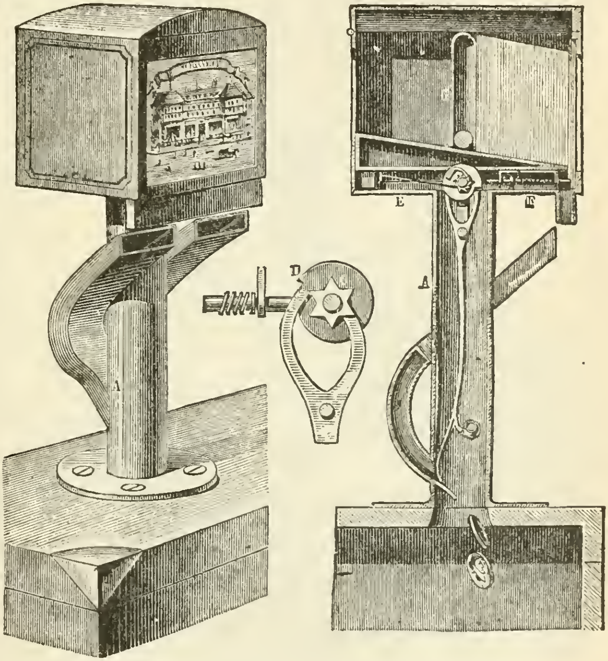
THE IMMENSE KRUPP GUN.

It is pleasant to turn to mechanisms of a more peaceful character. Among the inventions intended to obtain contributions from the visitors to our various benevolent institutions, we will describe a singular money box. This contrivance consists of a case or box, with a glass front, through which can be seen a landscape in miniature, with trees, houses and figures, all cut out of card board and painted with great nicety. On the box is a label requesting the visitor to drop a coin into it and await the result of the contribution. When the penny has fallen in, it puts in motion some hidden machinery, and then we see the people in the miniature landscape all in motion, riding or walking, or hunting, as the case may be.



THE WONDERFUL MITRAILLEUSE RIFLE GUN.

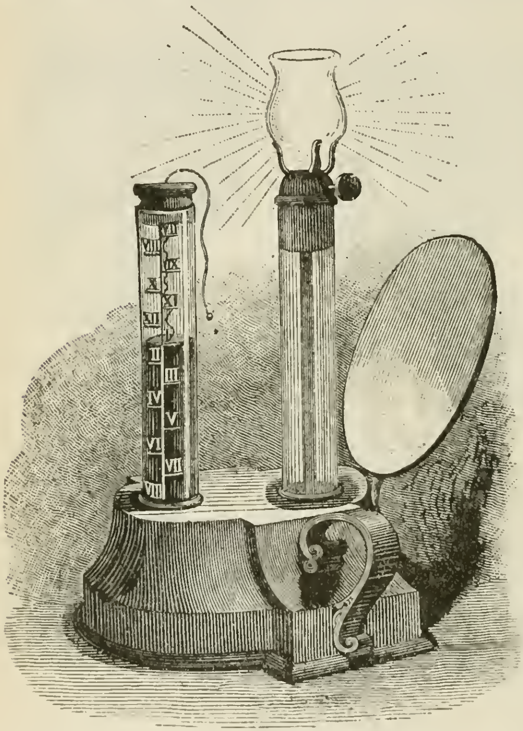
Another box is even more successful. for it places in the hands of the contributor a photograph of some celebrated person. But to obtain the photograph we must contribute a certain amount of money. The picture will not come out if we do not put in the proper coins, and the apparatus is perfectly fair and honest. At the top of the lower portion, where the money is received, is a hollow support, A, which sustains the box in which the photographs are placed upon an inclined plane, and resting against the glass. The pieces of money, in falling, strike the extremity of a vertical balance, which immediately turns a toothed wheel, C. The wheel has as many teeth as there are pieces of money necessary to purchase the photograph. Upon the escapement wheel is a ratchet arrangement, D, the shaft being moved by a cord rolled around it and attached to a spring, E. A bolt, F, moved by a spring, is kept constantly pressed against the "snail,' D. Then at each revolution, as the parts of the machinery are animated by the same movement, the bolt is withdrawn sufficiently to permit a photograph to fall, and then the card next following will be ready, resting upon the bolt. The photographs being placed upon an inclined plane, are pushed forward by a moveable frame, G, which has a roller at the base, so as one card falls out another is immediately replaced close to the glass.



A MONEY BOX THAT SELLS PHOTOGRAPHS.

Having obtained the photograph, let us present you with a description of a singular lamp, by which you may see it. The illustration represents an ingenious arrangement, which by means of combustion of oil in a lamp, indicates the hour of the night. The design explains itself. Two vertical tubes are fixed above the reservoir of oil. The left tube contains oil, and is marked with the hours; the right tube burns the oil as a lamp. The apparatus is so constructed by the inventor, that a certain quantity of oil burns exactly in one hour between two graduations of the hour tube. A reflector placed beside the lamp enables one to see the time by night very plainly.

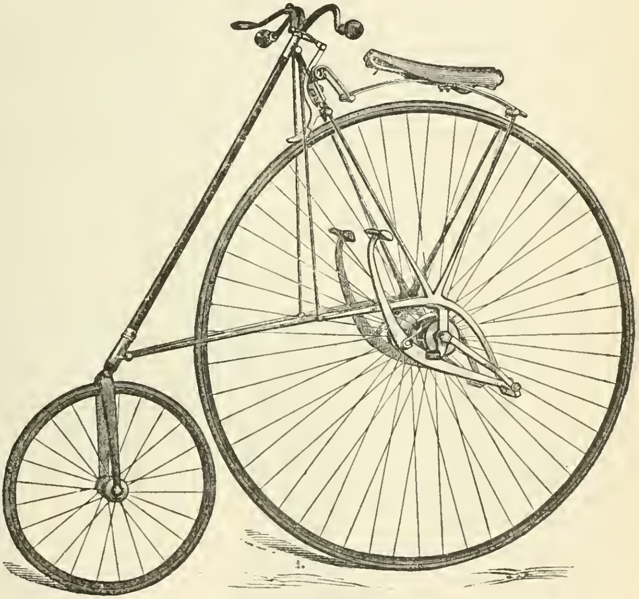
Possibly many of our readers have never thought that it is a very wonderful thing that a top should stand in a perpendicular position when spinning. Let any one try to balance a peg-top upon its point, and, after pronouncing the feat to be impossible, spin it, and see how readily the upright position is maintained; this is the principle in the common bicycle. Doubtless this species of vehicle will come into common use as a mode of locomotion. If it be true that one hundred miles can be traveled in a day with little fatigue, there is quite sufficient reason why it should be used. But the velocipede of the present day is a very different machine from that with which we have been for some time familiar.



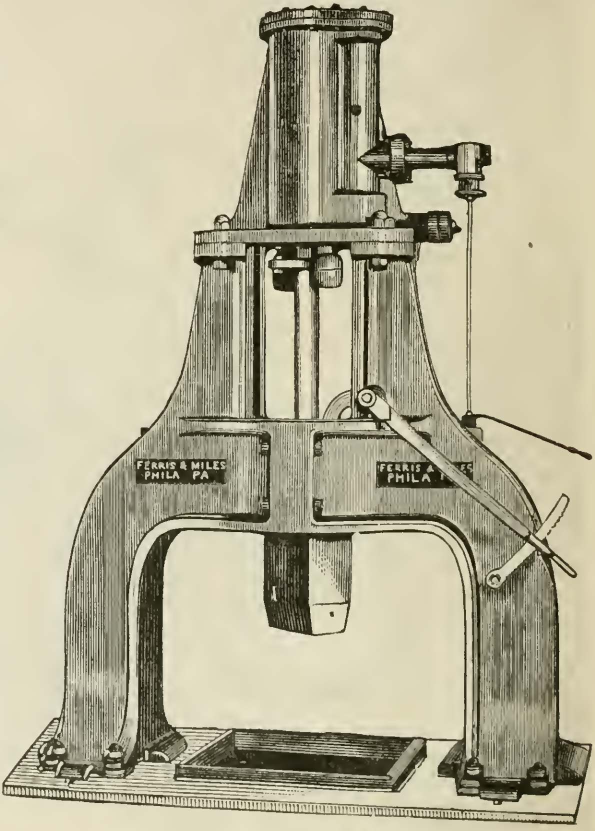
A CURIOUS OIL CLOCK.

Hitherto the machine has been a light framework with four wheels, which were turned by the feet of the driver alternately pressing down two treadles attached to cranks upon the axles of the wheels. But the velocipede of to-day only possesses two wheels, and these are in a line, so that the hinder wheel runs in the track of the former. The driver sits upon a saddle, astride the framework which holds the short axles of the wheels, and works the driving-wheel by treadles, and he guides the machine by the handle. But what keeps the bicycle in its upright position, for two wheels in a line are as difficult to balance as a single wheel by itself? The very same power which holds the spinning-top in its upright position. Of course the machine must be mounted while in motion, or the passenger must be supported until the motion is commenced. The same force is illustrated in the gyroscope, which is a heavy rim of metal round an axis. When this is set in swift rotation the axis will remain stationary in any position, provided one of its ends be supported. This strange property which a revolving body possesses is called the fixity of the axis of rotation, and it is the result of a general law that when matter is in rotation its axis, or the line upon which it rotates, remains stationary. So the axes of the top, of the velocipede, and of the gyroscope, all remain in their various positions in defiance of the ordinary law of gravitation, in this instance set aside.

This is a great law, and we are much indebted to it; for it is owing to its operation that our zones and the succession of our seasons remain unchanged. The earth rotates on her axis, and because of that rotation the position of her axis is fixed. Were this not so, the Esquimaux might in a few hours be under a burning tropical sun, and the efforts of the people in India to keep themselves cool might be rendered unnecessary by suddenly finding themselves within the Arctic Circle. And so it comes to pass that the earth's motion is absolutely necessary to her stability.

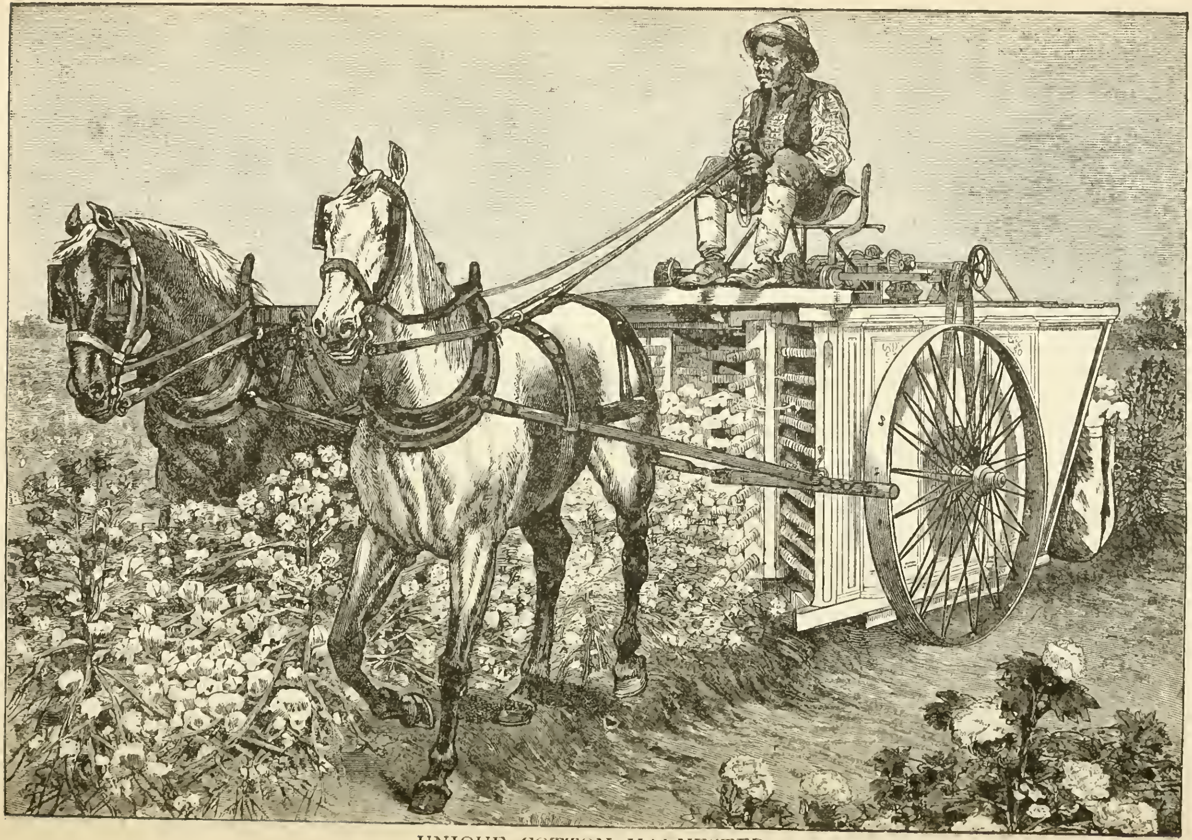

THE BICYCLE.

Among the many appliances of steam, around which so many marvelous inventions cluster, the machinery constructed for heavy iron work claims our attention. The steam-hammer has now become indispensable in every engineering workshop, and its introduction marks a new period in the history of mechanical progress. It was invented by James Watt and Deverell, and patented nearly half a century ago; next, Mr. Nasmyth designed and applied the self-acting motion, so as to complete the steam-hammer in its present compact and manageable form. In this extraordinary implement or tool, a heavy block of cast iron, sometimes five tons in weight, and attached to the lower end of a piston-rod working in an inverted cylinder, is lifted by admitting the steam beneath the piston, and then allowed to fall upon the work by its own weight; by a little management it may also be made to slide up and down without striking at all. The heaviest work is forged under the blow of this ponderous hammer, which acts with an energy that the strength of iron cannot withstand; yet it is kept in such control that a nut-shell may be cracked, or an egg-shell chipped, as easily as iron beams are welded or shaped. By means of this machine a pile can be driven into the ground in four minutes that previously required for the operation twelve hours. The saving of time thus effected is as one to one thousand eight hundred; and it is impossible to express more strikingly the power of this wonderful tool. Five or six hundred blows per minute can be struck if required, or five blows every second.



THE POWERFUL STEAM HAMMER.

In the air-hammer, compressed air is employed as the moving power in the place of steam. The machine consists of a force-pump, supplying compressed air to a reservoir, and a working cylinder and piston similar to those of a steam-hammer, having mechanism for varying the action of the hammer as required, and increasing the rapidity of the blows eight hundred strokes per minute.



UNIQUE COTTON HARVESTER.

One of the most useful, successful and wonderful modern inventions is the cotton harvester. It is not too much to say that the disabilities under which the cotton-growers of the South sometimes labor in gathering their crops, owing to the uncertainty of negro labor and the insufficiency of the labor supply, are likely to be entirely removed by the introduction of this cotton harvesting machine.

A satisfactory test was made on the main floor of the New York Cotton Exchange, in the presence of many brokers and practical planters. After the test the machine remained on exhibition in the Exchange building for one week, and a large number of gentlemen, interested in plantations, examined it closely and with entire satisfaction. Its efficiency had previously been very clearly shown at private tests made at the factory, when as high as 76½ per cent. of cotton, on dry and withered plants, was picked off without breaking a stalk. The operation of the machine is as follows:

Four vertical endless belts are arranged in a frame supported upon two wheels which furnish the power to drive the mechanism. These belts move horizontally and carry rotary picker stems, which are placed perpendicular to the face of the belt and journaled thereon. Two of these belts are mounted on each side of the machine and are driven so as to carry the picker stems rearward in time with the forward movement of the machine along the cotton row. The row of plants passes between the belts, which by their movements carry the picker stems into the plant and to the rear at the same time the picker stems are rotated and wind the cotton upon themselves. After being filled with cotton they are withdrawn from the plant by the movement of the belt and pass into a receiving compartment, where the direction of the rotation of the picker stems is rapidly reversed and the cotton is unwound and drops upon a carrier belt which in time delivers it upon the elavator, by which it is deposited in a bag in the rear of the machine.

The picker stems are made of hard wood, having pointed brass pins inserted at a certain distance from each other and inclined to the surface. These pins are suitably protected so as to avoid injury to the unripe cotton and stalks.

The machine is fitted with a tongue and is drawn by two horses, one on each side of the row, and has a seat on top for the driver, from which position he can direct the operation of the machine, stopping or starting its parts instantly by suitable levers within easy reach. The weight of the machine complete is about 900 pounds.

CHAPTER XXI.

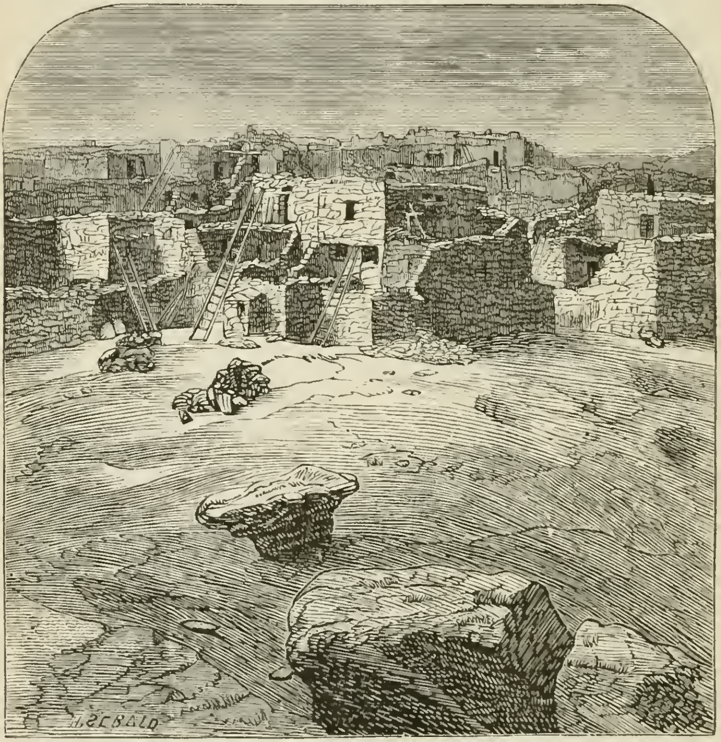
WONDERS OF ARCHITECTURE.

The Moquis and Their Rude Habitations—The Mound Builders—Aztecs and Zunis—"Dead Town"—Solomon's Gorgeous Temple—A Famous Temple in India—A Noted Church in New York—The Metropolitan Post-Office—Grand Public Buildings and Post-Office in Philadelphia—The Imposing Capitol at Washington—The Roman Coliseum and Trajan's Renowned Column—Arches of Trajan and Napoleon—The Bridge of Sighs—Marvelous Palace of the Escurial—The Golden Palace of Nero—Architectural Grandeur Spoiled by War.

THE singular houses to be seen among the Moquis, the half-civilized tribe of Indians in Arizona, lead to the well-founded supposition that they are the last remnants of the pre-historic races, including the Aztecs and Zunis, which formerly dwelt farther south in Mexico and New Mexico, and are known in common phraseology as the Mound Builders. There are sure traces of the Aztecs and Zunis. The former preceded the coming of the Spaniards while the latter appear to be closely allied with the Indian tribes, and were predecessors of races still existing. The Mound Builders had a marvelous method of constructing their edifices. They built with earth, made excavations in hills, utilized eminences where they could, and by removing and banking earth formed habitations which, in ruined form, remain to the present day, the memorials of a people who have passed from existence and almost from history. The Moquis only remain.

The three Moqui towns, on the one mesa or eminence, are situated in the centre of an oval plain, some twenty by thirty miles in extent. It appears to be walled in by precipitous mountains, with five or six openings; but this is only in appearance, as a succession of rigid mesas, scattered over the country, appear to the traveler at any point as forming a circle. Around the border, where it rises toward the enclosing hills, the plain is rich in bunch and white-seed grass; whence toward the towns it falls off to a horribly barren plain of dry and burning sand. From this plain the mesa rises, oval-shaped and equally on every side, to the height of one thousand or twelve hundred feet. This rocky mole, of mingled white and red sandstone, with a lower stratum of soapstone, is nearly half a mile long, and not quite a quarter wide. From the edge the cliff falls off perpendicularly, or even with a slight overhang, some half way down; then the foothills begin and slope away in a succession of sandy inclines. At one place only, by rock-hewn galleries and dug and walled ways, can horses reach the summit. In two other places persons can descend or ascend by toilsome climbing. Up one of these, leading to the main spring, you might toil for an hour. The Moqui women ascend it in fifteen minutes, with heavy water jugs slung on their heads, springing from shelf to shelf of the rock with amazing agility.

The three or four springs which supply the place break out from under the rock about the point where the abrupt cliff joins the foothills, and can all be fortified against the approach of an enemy from below. All the provision is stored as fast as gathered in the houses, and thus they seem always ready to sustain a long siege. As far as possible up the cliffs, where caves open inward, flats have been worked upon the rock, and sheep and goat pens constructed leading into the caves. As you stand upon the cliff soon after sunrise you can look down hundreds of feet into the outer portion of these pens, and see the Moquis milking their goats in what seems like a great rocky balcony



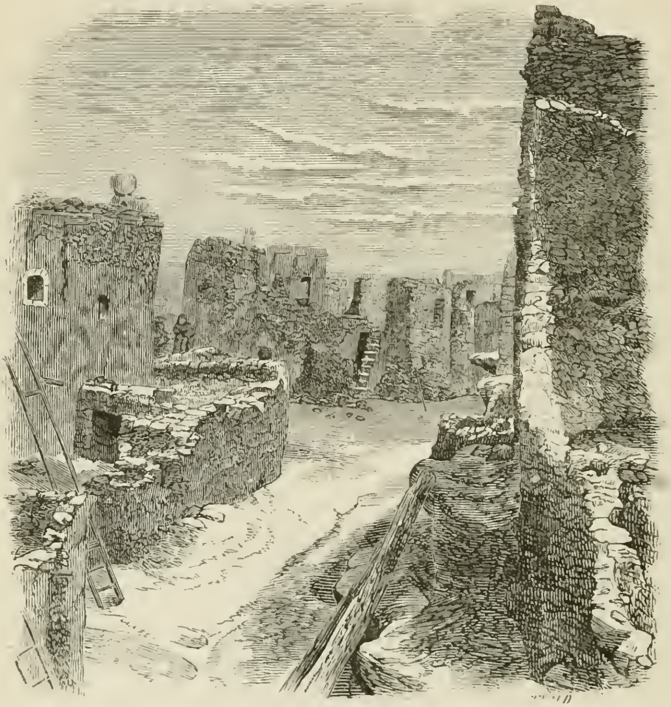
CURIOUS DWELLINGS OF THE MOQUI INDIANS.

standing out from the wall. All around extends the yellow plain, and as you walk upon these heights in the bright starlight, it seems tossing and heaving below like a sea of molten brass.

Moqui, a common name given by whites and the other Indians, is only the name of one town; but there are seven in all. The first three on this mesa contain altogether about a thousand inhabitants. Their houses are generally square, and of first-rate architectural design. They are built of flat stones laid in a fine cement, which seems to harden with time; the joists are of immense timbers, apparently a species of sugar pine, hewn round; they are plastered heavily inside, and whitewashed with a material which gives a hard, smooth polish. Thus they are easily kept clean, and always have a neat, inviting appearance; indeed, there is very little dust or dirt flying about on the mesa. Sand storms raised below, strike against the cliff some distance down. Houses are built together in groups, with but narrow passages between and thus neither town covers more than four or five acres. They are two or three stories in height, the stories each very high except the lowest. That is seldom used in summer, and not being more than four or five feet high, you would think it only a raised platform on which the main house stood, until they show you square holes opening into it, and the interior arranged for living. On this, the second story, two or three feet narrower all around, rises ten or twelve feet. Upon the joists of this are piled willows, or other long branches two or three feet deep, covered with dirt, which is again overlaid with hard plastering, smoothed and polished, making at once roof for the second, and floor for the third stories. This is never more than half or a third as large as the second, and the upper walls are often built directly across the lower, and supported entirely by the immense joists. The Moquis sleep on these roofs altogether, ascending by ladders, or by the projection of stone always built out at one of the corners so as to form a rude staircase. The better class carpet their houses with sheep-skins, and all have sheep-skins to sit on, though the floor is kept scrupulously clean. There is not dampness enough to produce troublesome mold, even in the lowest story, and only one noisome insect, the presence of which is at once betrayed by the whitewash, so it is easily guarded against.

One part of this settlement is known as the "Dead Town," receiving this name from its forlorn and deserted appearance. The ruins give a very good idea of the construction of the buildings. Few timbers are used, and the stony, solid, earthy character of the dwellings is evident. The windows are small, and are often so placed as to admit very little light. From the buildings in "Dead Town" it will be seen that no regular order of architecture is followed, yet these dwellings are wonderful for their compactness, strength and comfort.

The rude constructions of the Aztecs, Zunis and Moquis represent one extreme of architecture. It is "of the earth earthy." No simpler style of building could be imagined. If we wished a specimen of the opposite extreme of architecture, the beautiful, ornate and costly, we would find it in the most renowned religious edifice of ancient times, the far-famed temple of Solomon. Nothing could be farther removed from the style of building just described.



RUINS OF A DESERTED AZTEC VILLAGE.

The temple occupied one of the three eminences on which the city of Jerusalem was built, and which is well known to the Scripture reader as Mount Moriah. Though the term Moriah was afterwards confined to the particular hill on which the temple was built, it originally comprehended the several mountains round about Jerusalem. At the division of Judea among the twelve tribes, it so happened that, small as the space on the top of Moriah was, it became the property of two tribes; for the greatest part of the temple courts was in the portion of Judah; and the altar, porch, holy and most holy places, were in the portion of Benjamin. In its original state, the summit of Moriah was unequal, and its sides irregular; but it was a part of the ambition of the Jewish kings to have it levelled and extended. Almost the whole of this space was arched under ground, to prevent the possibility of pollution from secret graves; and it was surrounded by a wall of excellent stone, forty-seven feet high; without which lay a considerable extent of flat and gently-sloping ground, which was occupied by the buildings of the tower of Antonia, the gardens and the public walks.

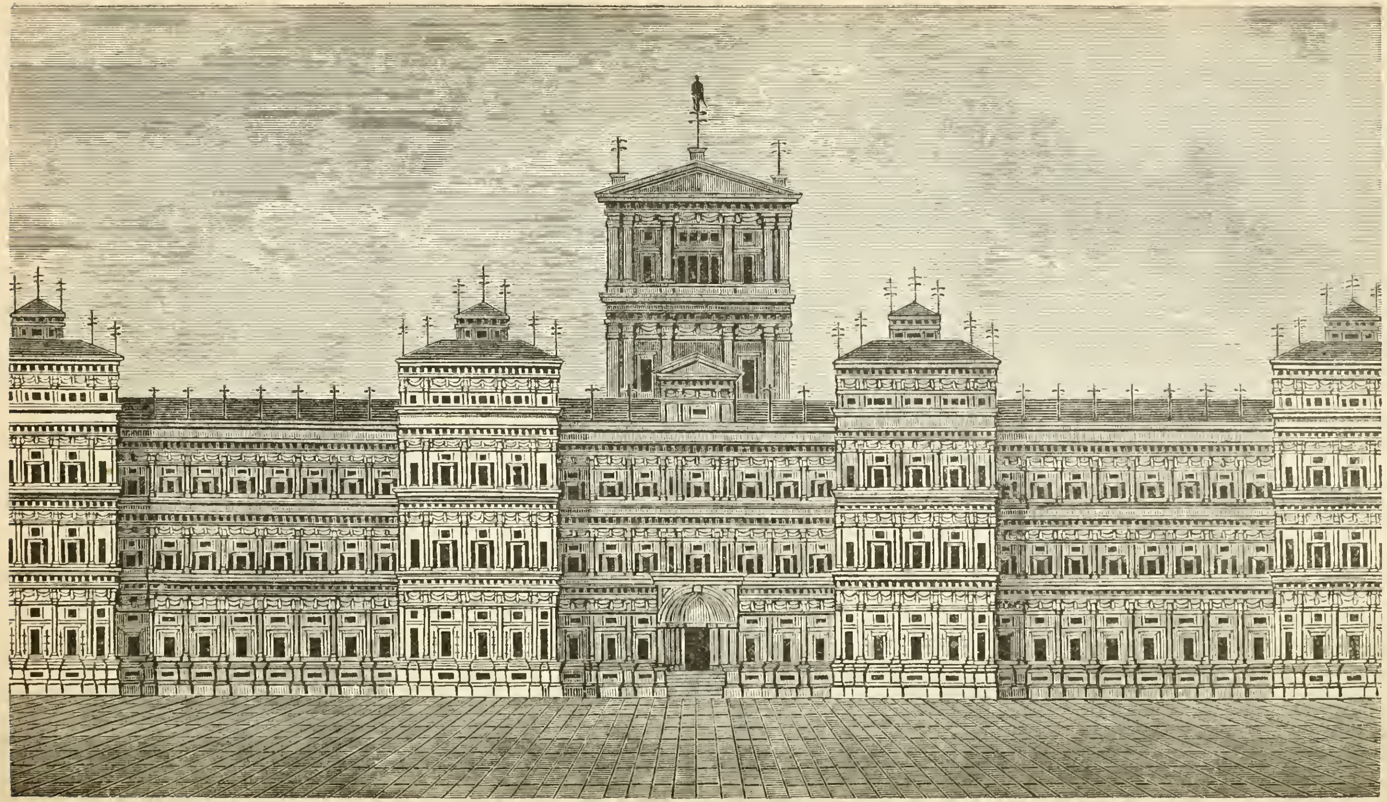
The plan and the whole model of this structure was laid by the same Divine Architect as that of the tabernacle, and it was built much in the same form as the tabernacle, only of much larger dimensions. The utensils for the sacred service were also the same as those used in the tabernacle, only several of them were larger in proportion to the more spacious edifice to which they belonged. The foundations of this magnificent edifice were laid by Solomon, in the year of the world 2992; and it was finished A. M. 3000, having occupied seven years and six months in the building. The front or entrance to the temple was on the eastern side, and consequently facing the Mount of Olives, which commanded a noble prospect of the building; the holy of holies, therefore, stood towards the west. The temple itself, strictly so called, which comprised the portico, the sanctuary and the holy of holies, formed only a small part of the sacred edifice, being surrounded by spacious courts, chambers and other apartments, much more extensive than the temple itself.

The court of the Gentiles was one into which persons of all nations were permitted to enter. The most common approach to this was by the east gate, which was the principal gate of the temple. It was by far the largest of all the courts pertaining to the sacred building, and comprised a space of fourteen English acres. We must not overlook the beautiful pavement of variegated marble, and the piazzas or covered walks, with which this court was surrounded. The porch called Solomon's was on the south side or front of the temple, and was so called because it was built by this prince upon a high wall.

The court of the women, called in Scripture the new court, and the outer court, was so designated by the Jews, not because none but women were permitted to enter it, but because it was their appointed place of worship, beyond which they might not go; unless when they brought a sacrifice, in which case they went forward to the court of Israel. The gate which led into this court, from that of the Gentiles, was the beautiful gate of the temple, so called because the folding-doors, lintel and side-posts were all overlaid with Corinthian brass. The court itself had four gates, one on each side; and on three of its sides were piazzas with galleries above them, whence could be seen what was passing in the great court. At the four corners of the court were four rooms appropriated to different purposes. In the first, the lepers purified themselves after they were healed; in the second, the wood for the sacrifices was laid up; the Nazarites prepared their oblations and shaved their heads in the third; and in the fourth, the wine and oil for the sacrifices were kept. There were also two rooms more, where the Levites' musical instruments were laid up; and also thirteen treasure chests, two of which were for the half-shekel, which was paid yearly by every Israelite; and the rest for the money for the purchase of sacrifices and other oblations. The court of Israel was separated from the court of the women by a wall. This was divided into two parts, one of which was the court of the Israelites, and the other the court of the priests. The former was a kind of piazza surrounding the latter, under which the Israelites stood while their sacrifices were burning in the court of the priests. It had thirteen gates, with chambers above them, each of which had its particular name and use. Within this court stood the brazen altar on which the sacrifices were consumed, the molten sea in which the priests washed and the ten brazen lavers for washing the sacrifices; also the various utensils and instruments for sacrificing.

A building of great splendor was that of Solomon, in which both the finest taste and the most astonishing wealth were represented, but the later glory, even after the ravages of war, was fully equal to the former. Herod, having slain all the Sanhedrim except two, in the first year of his reign, resolved to atone for it by rebuilding and beautifying the temple. This he was the more inclined to do, both from the peace which he enjoyed, and the decayed state of the edifice. For, besides the common ravages of time, it had suffered considerably by the hands of enemies; since that part of Jerusalem was the strongest, and consequently the last resort of the inhabitants in times of extremity. After employing two years in preparing the materials for the work, in which one thousand wagons and ten thousand artificers were engaged, besides one thousand priests to direct the works, the temple was pulled down. Herod's temple was fit for divine service in nine and a half years; but a great number of laborers and artificers were still employed in carrying on the out-buildings all the time of our Savior's abode on earth, and even till the appointment of Gessius Florus as governor of Judea.

The vast sums which Herod laid out in adorning this structure gave it the most magnificent and imposing form. Its appearance, says Josephus, had everything that could strike the mind and astonish the sight. For it was on every side covered with solid plates of gold, so



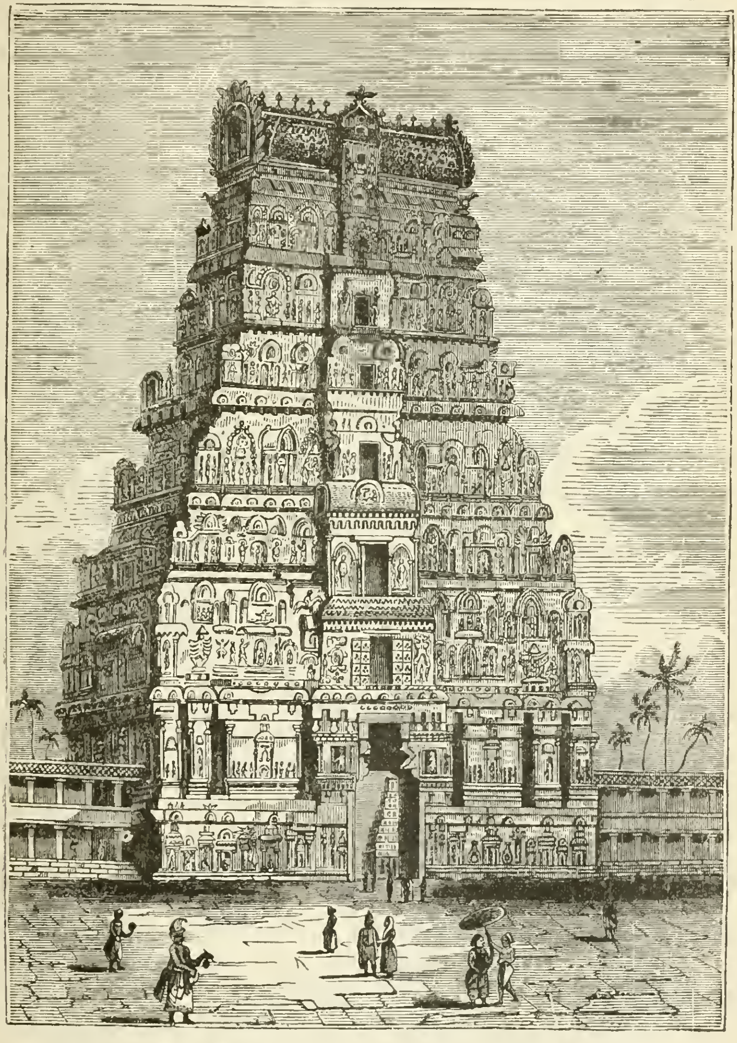
SOLOMON'S TEMPLE—THE MOST WONDERFUL BUILDING IN THE WORLD'S HISTORY.

that when the sun rose upon it, it reflected such a strong and dazzling effulgence, that the eye of the beholder was obliged to turn away from it, being no more able to sustain its radiance than the splendor of the sun. To strangers who approached the capital, it appeared at a distance like a huge mountain covered with snow; for where it was not decorated with plates of gold, it was extremely white and glistening. The historian, indeed, says that the temple of Herod was the most astonishing structure he had ever seen or heard of, as well on account of its architecture as its magnitude, and likewise the richness and magnificence of its various parts, and the fame and reputation of its sacred appurtenances. And Tacitus calls it a temple of immense opulence. Its external glory, indeed, consisted not only in the opulence and magnificence of the building, but also in the rich gifts with which it was adorned, and which excited the admiration of those who beheld them.

It has always been a custom with eastern countries to pay special attention to their sacred edifices. The amount of ornamentation is, in many instances, surprising, consisting in large part of carved work, an art in which the natives of the East have always excelled. Some of the temples of India are marvels of architectural beauty and decoration. The pagoda of Chillenbaum is one of the most celebrated, a structure that appears to rise in terraces, and exhibiting every variety of ornament. The bas-relief is largely allegorical, and intended to convey ideas and lessons associated with the worship of Pagod, the great Indian idol.

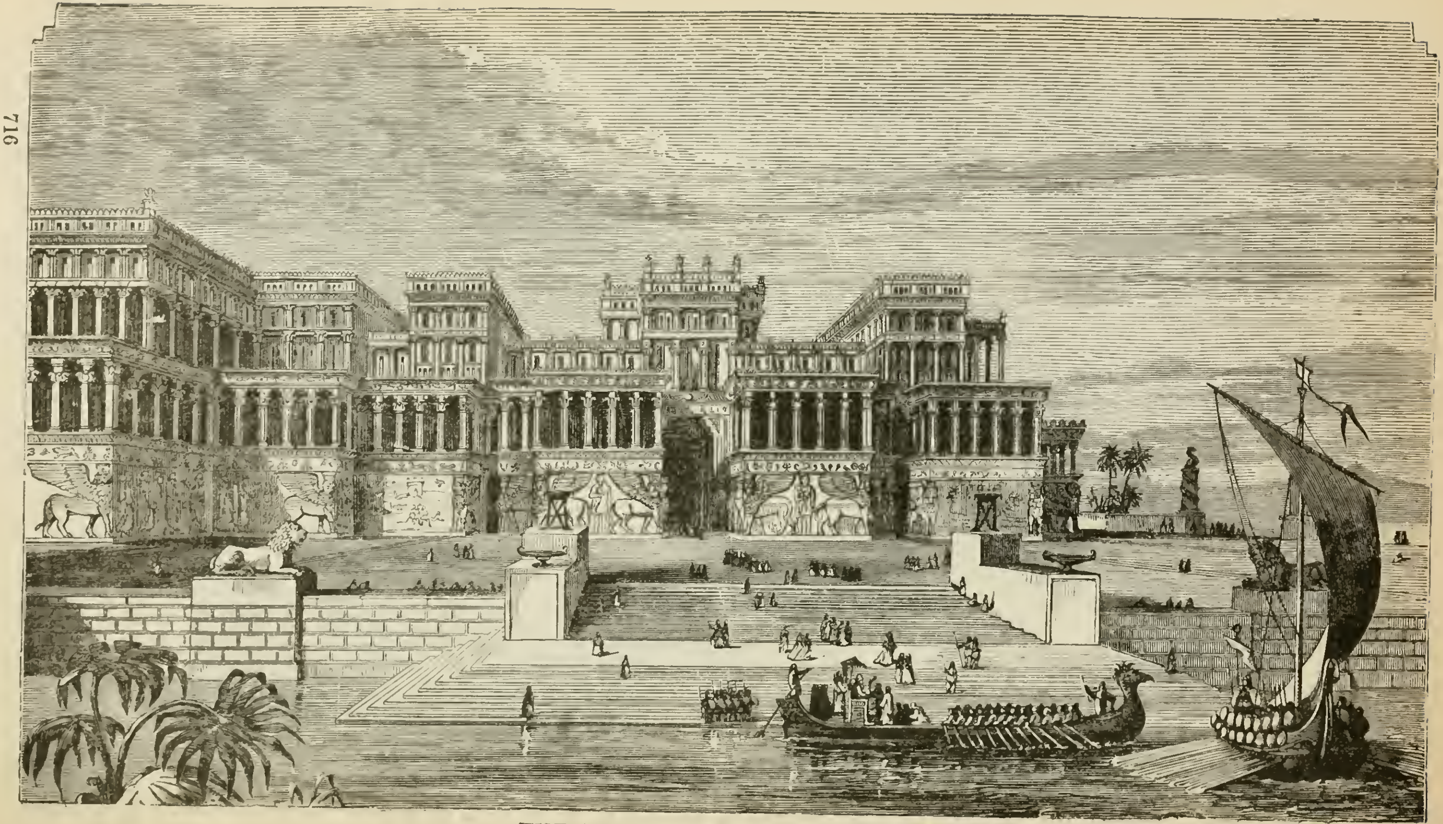
The architecture of the Assyrians was of a very high order Although stone was plentiful in eastern Assyria, brick was preferred in the construction of their edifices. Their most magnificent buildings were their royal palaces. Less religious than the Egyptians and Greeks, they showed more attention to the king than to the gods, and their temples were insignificant compared with the royal residences. The most complete of the Assyrian palaces that has yet been uncovered is that of Sargon, at Khorsabad. It exhibits the architecture of this nation, and also its decorative art and sculpture, in their highest forms. The palace proper consisted of a series of buildings ranged around immense courts. The main building, occupied by the king, stood at the bottom of the principal court, and possessed a perfectly regular façade, with a magnificently ornamented gateway in the centre. In the interior arrangements of the building there was neither regularity nor symmetry.

This building was most lavishly ornamented; it comprised six immense halls, decorated with sculpture, and some other smaller rooms. It was, we may almost say, a second palace grafted on to the first—a second selamlik, rivaling in splendor that of the seraglio. The passage opening into the southeast side of the reception hall of the seraglio led to the lower platform, and to the offices. The lower platform of the artificial hill built up for the palace of Sargon was



THE REMARKABLE PAGODA OF CHILLENBAUM—INDIA.

occupied by the khan and the harem. This portion of the edifice looked towards the city, and communicated directly with it. In the midst was the khan, properly so called; that is, an immense square court, surrounded on all sides by buildings, stables, lodgings for



THE ROYAL PALACE AT NINEVAH.

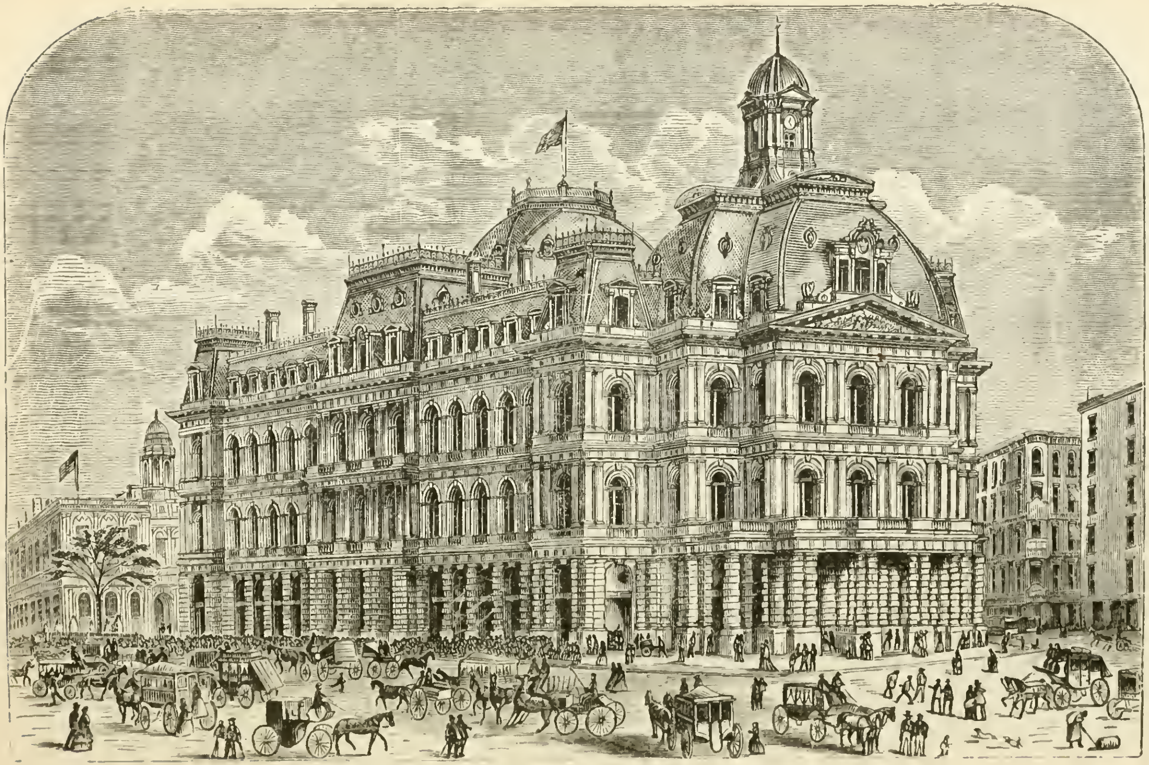
grooms, and for the greater number of slaves. It was approached from the city by two enormous flights of steps in the middle of the southeast face of the terrace. An elaborately decorated passage led from this court of the khan into the reception hall of the seraglio; two small doors also gave direct communication with the inhabited rooms of the palace. To the right of the immense court we have just mentioned, the khan, was a building of some extent, with many courts and numerous chambers, forming part of the offices or common rooms of the palace. This was the khazneh, or treasury; for there were the stores of provisions and utensils for the use of the royal household, as well as places of custody for all the valuables that Sargon, in his dedicatory inscription, tells us he had acquired by force of arms and stored in his palace.

The harem was adjoining the khazneh. It was a building of moderate extent, containing three courts, the walls of one of them covered with the richest decorations in enamelled bricks; many long galleries, intended no doubt for feasts or festivals; and lastly a large number of rooms for habitation. This harem was shut in as closely as possible; all communication with the outer world was intercepted, and the women must have found themselves in a real prison. One single vestibule, guarded by eunuchs, gave access to it; this had two issues; one communicating with the great court of the offices, was the entry by which people came in from the outside; the other opening on a long, narrow court leading to the inhabited apartments of the seraglio; through this the king had access to his harem without being seen by the public. Behind the harem was an enormous tower, or pyramid in seven stages, nearly fifty yards high. The seven stages, equal in height, and each one smaller in area than the one beneath it, were covered with stucco of different colors, and thus presented to view the colors consecrated to the seven heavenly bodies, the least important being at the base.

Turning now to remarkable structures in our own country, we have a building whose architectual proportions give one a good idea of those great business edifices which, within a few years, have been multiplying rapidly in all the great commercial centers of our land. In the lower part of the City Hall Park stands the New York post office, one of the finest buildings on the continent. The corner-stone was laid in June, 1869, and the building cost upwards of four million dollars. The exterior walls are built of granite, and the greatest side-length is three hundred feet. The trenches in which the retaining walls and pier foundations were to be laid had to be completely incased in sheet-piling, shored across with timbers, under the protection of which the excavation was carried on and the masonry laid. The excavation was done mostly at night, the ground being illuminated by magnesium light. The outer walls, and those of the court, and the foundations of the interior columns are based on huge granite blocks, the granite being laid on massive beds of concrete. One hundred and fifty-nine iron columns in the basement, and one hundred and seventeen in the first story, support the walls and floors. The piers of the cellar are of granite, or arcaded brick and iron; the stairs are of stone and iron; the chimneys, of stone; the roof and its ornaments, of iron, covered with slate and copper. Four large low-pressure boilers supply the steam for heating the entire building. The roofs of the corner pavilions rise one hundred and seven feet above the sidewalk. The entire circuit of the building is over one-fifth of a mile.

The style of architecture is the classical Italian Renaissance, with some modifications to harmonize with the treatment of the roofs, which are French, as best suited to such architecture on a large scale. The mansard roof is covered with an ironclad cornice and metallic cresting. The irregular angles imposed by the shape of the lot are marked by semi-hexagonal pavilions. The main building line is withdrawn from the lower, or southerly front, to extend the façade on that side. The roof, square-domed, rests on three arms of a Greek cross, out of the centre of which rises a heavily buttressed cupola, carrying projecting pediments, with detached columns on its four faces. The foot of the flagstaff, which surmounts the cupola, is one hundred and sixty feet above the sidewalk.

The centre of the largest and northerly front is relieved by a broad pavilion with a two-story colonnade, roofed with a dome, the balustrade of which is one hundred and fifty feet above the sidewalk. The dome is lighted by a range of round windows, and surmounted by an attic, ornamented by a sculptured pediment and a crown with the national arms. The form of the building is, substantially, a trapezoid, with an open triangular court in the centre, below the main story; it includes a sub-basement, basement, three stories in the walls, and a roof story. A drive-way, or street, forty feet in width, reserved from the northerly side of the ground purchased by the Government, serves as an approach to that front, and secures the perfect isolation of the building, with perpetual access of light and air on that side, as well as on the other side, whatever changes may hereafter be made in the adjoining ground. The first story occupies the entire space of the building, including the central court, which is here roofed with glass; the walls of which, with all the interior partitions of the stories above, are, in this story and the basement, carried on columns, leaving the whole



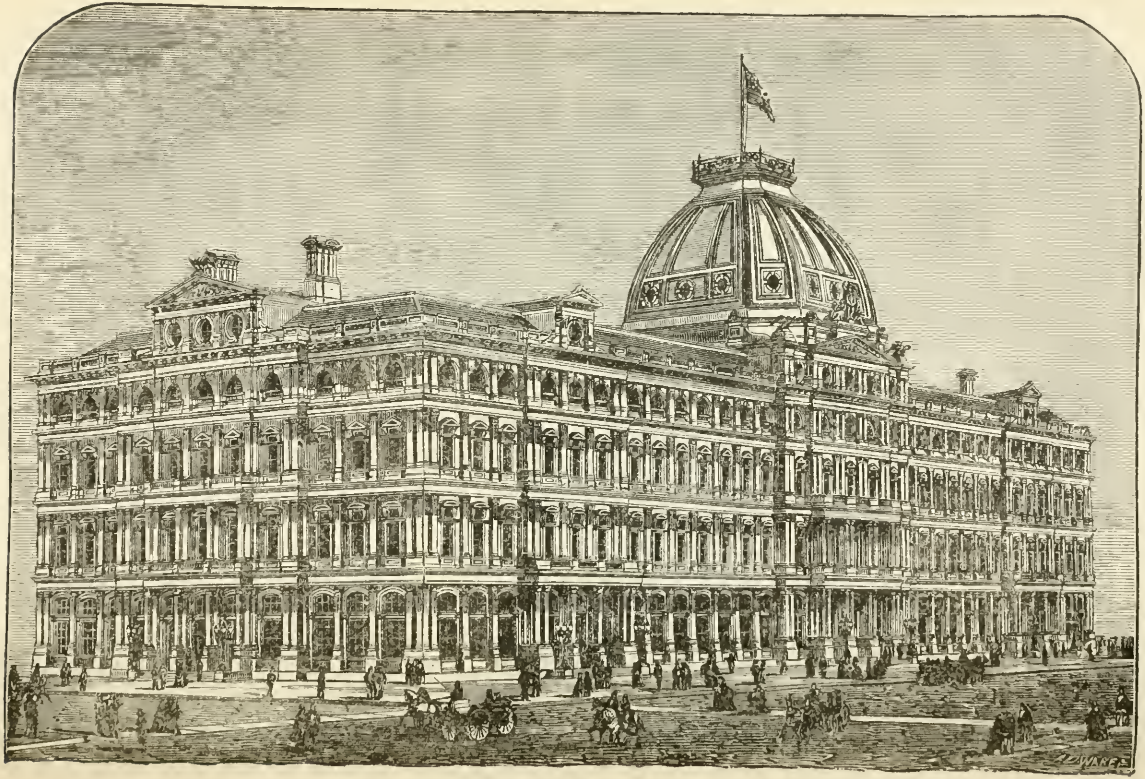
THE NEW POST OFFICE—NEW YORK CITY.

area of the Post-office roof open to light and free use and communication.

Equally famous as a public building is the new Post-office in Philadelphia, which for its immense size, its solid proportions, its convenient arrangement, and finished workmanship, has been the wonder and admiration of all who have seen it. It extends the entire length of the square bounded by Chestnut street on one side, and by Market street on the other. It is four stories in height, not including the mansard roof, is surmounted by an imposing dome and cupola, while below there are spacious pavements on three sides. The material is granite, and no pains were spared in the choice and arrangement of the materials. The great length of the building is one of the things that impress the visitor. Ample accomodations for light are secured, and the interior offices and conveniences for receiving and shipping the mails are all that could be desired. It is one of the costliest buildings on the continent, and adds another to those stately edifices which, at vast expense, the Government has been rearing during the last few years, and which are rendering our country celebrated for its proficiency in the best and most approved styles of architecture.

A short distance from the Post-office may be seen the Public Buildings, erected by the city of Philadelphia, and in many respects the most wonderful structure this side the Atlantic. For area, thickness and solidity of walls, height and architectual magnificence, it stands without a rival. The material is marble, and the ornamental carvings and statues add greatly to the general effect.

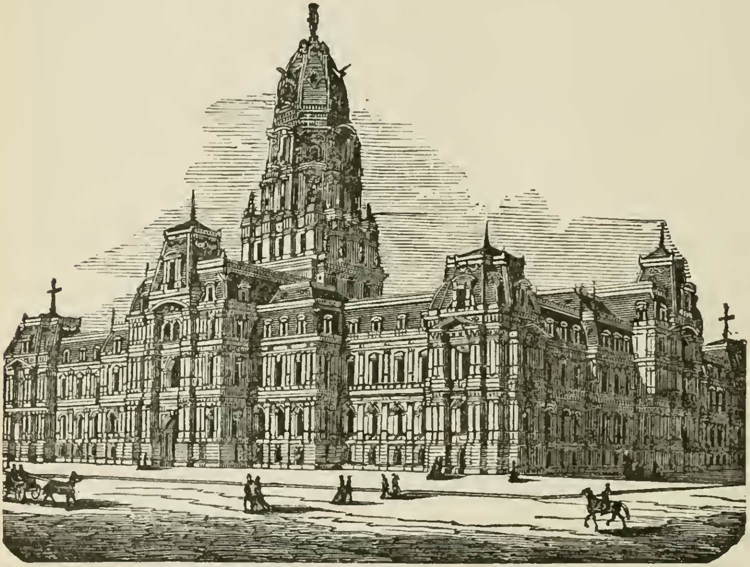
The first stone of the foundation was laid on the twelfth of August, 1872. The material in the tower weighs sixty thousand tons. From the street to the top of William Penn's broad-brimmed bronze hat will be a distance of five hundred and thirty-seven feet four and one-half inches. The foundation walls are fifteen feet high to the surface of the ground and twenty-six feet thick. Underneath these walls concrete, eight feet six inches thick, is laid on the gravel bottom. The walls of the tower at the base or ground surface, are twenty-one feet thick on the south side, and twenty-three feet thick on the north. The east and west walls are twenty-nine feet thick over all. The walls of the ground floor or first story are twenty-one feet thick. At the level of the roofs of the buildings the tower is seventy-one feet square, and the walls are fourteen feet six inches thick and remain the same thickness to a height of one hundred and ninety feet above the street. From a point one hundred and ninety feet high, almost to the beginning of the iron work, the walls are nearly fourteen feet thick. The marble blocks run from three to four feet in thickness, and are fastened to the inner brick walls



THE NEW POST OFFICE BUILDING—PHILADELPHIA.

with galvanized clamps. Flues, a foot square, two at each corner of the tower, run down through the brick work, and great iron posts pass through them to a depth of about one hundred feet, to anchor the iron clock tower and the dome.

The bronze statue of William Penn, which forms the pinnacle of the dome, measures thirty-six feet from the feet to the hat. Each foot is four feet and eight inches long. Penn's bronze waist measures one hundred and forty-four inches. The bronze hat is as large as the cover of a buggy, and a finger of one of the bronze hands, almost as large as a man's arm. At the four corners of the clock tower, just at the base of the dome, one hundred and fifty feet below Penn's statue, are four groups, in bronze, one at either corner—an Indian and his dog, a squaw and her boy, a Swedish settler and his boy and a Swedish woman peasant and a lamb. Each one of these groups measures twenty-four feet in height. These four groups weighs thirty-nine tons.



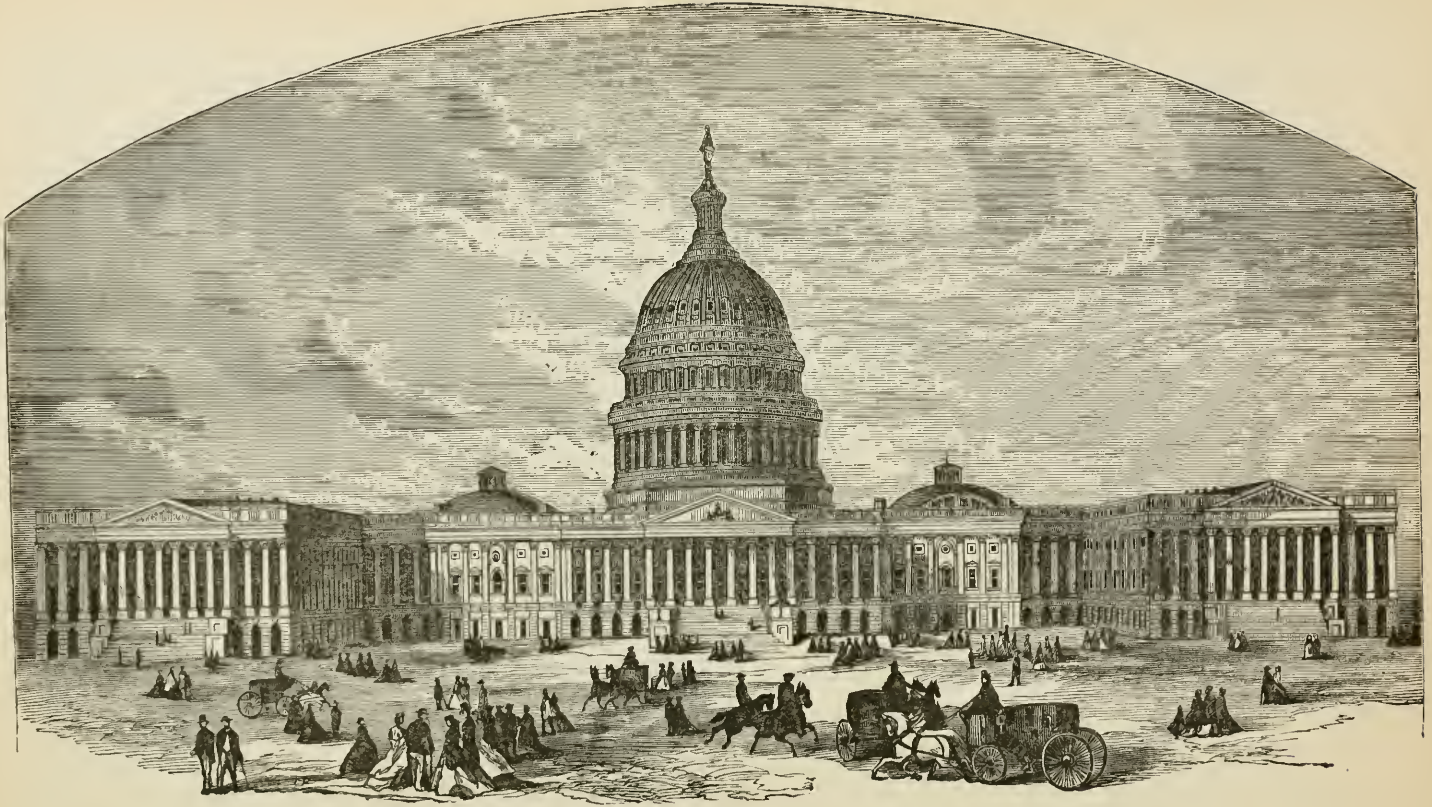
THE MAGNIFICENT NEW CITY HALL BUILDING—PHILADELPHIA.

Two big elevators carry visitors from the ground floor of the tower to the visitors' observatory. There are four large open spaces, eight feet wide, leading out on to broad balconies at the bottom of the clock story. The observatories are two hundred and ninety-three feet above the street level. The observation room leading out on to the balconies is thirty-nine feet in diameter in octagonal form and the ceiling of the room is thirty-five feet high. The room accomodates about one hundred persons comfortably, and about fifty persons are able to stand on the balconies at one time.

Among the wonders of architecture must be mentioned our Capitol at Washington, whose great white dome is, from all directions, the first object in the city to attract the eye. Its general plan is that of a central building, surmounted by a dome, and flanked by two wings. Its entire length, from north to south, is seven hundred and fifty-one feet, with a breadth of from one hundred and twenty-one to three hundred and twenty-four feet in its different portions. The building covers nearly three and a half acres. The total cost of the building has been about thirteen million dollars. The height of the wings is seventy feet, while that of the dome, from the ground to the Goddess of Liberty upon the summit, is two hundred and eighty-five and a half feet. The material of the main building is freestone; that of the wings is white marble, while the dome is of iron. The rotunda, occupying the central portion of the main building, is one of the principal attractions of the Capitol. It is a circular hall, ninety-six feet in diameter, by one hundren and eighty feet in height to the top of the canopy above. On this spherical concave is painted a mammoth fresco by Brumidi, representing allegorical and historical subjects. The panels which surround the rotunda, nearly on a level with the spectator, are adorned with historical paintings.

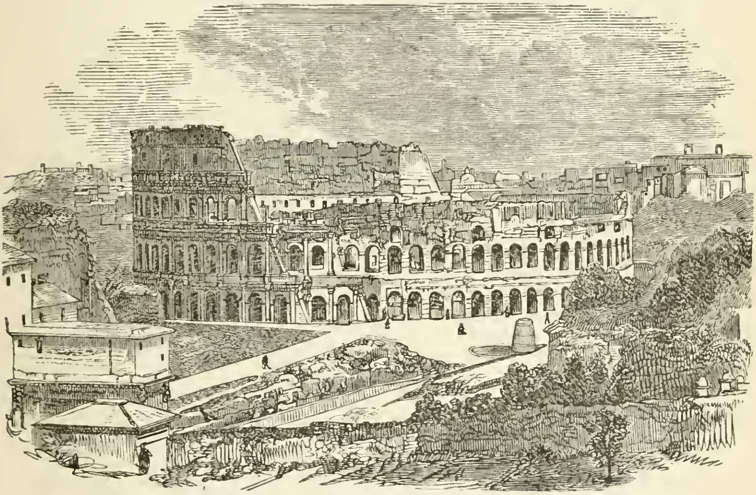
The Senate chamber occupies most of the north wing, and accommodates seventy-six senators, while the galleries have a seating capacity for a thousand spectators. This room is without artistic decorations, with the exception of the glass panels of the ceiling, which have symbolic designs. On either side of the Senate chamber are the Senate committee rooms, most of which are richly frescoed. Other rooms in this wing are richly finished in Italian and Tennessee marbles. The staircases, also, are of white and Tennessee marble. The south wing is occupied by the Hall of Representatives and the numerous committee rooms. The hall is the largest legislative room in the world, being one hundred and thirty-nine by ninety-three feet, affording space for three hundred members, while the galleries will seat one thousand five hundred spectators. The Library of Congress occupies the western projection of the central building. The Supreme Court of the United States has its room in the central building also. The interior of the Capitol is finished throughout in marbles, with floors of stone or tiles. The walls and ceilings are beautifully frescoed. It contains very many works of art, statuary, paintings, and symbolic frescoes.

Among the many stupendous architectural works of antiquity which surprise us by their extent, their beauty, and the wonderful difficulty



FRONT VIEW OF THE MAGNIFICENT CAPITOL BUILDING—WASHINGTON, D. C.

of their construction, the Roman Coliseum stands out pre-eminent. Its ruins refuse to perish, and there they stand in colossal majesty, the astonishment of all beholders. As will be seen by the annexed drawing, the Coliseum was an amphitheatre, of which the external walls consisted of four tiers of arcades, adorned with columns of the Doric, Ionian, Corinthian, and Composite orders. The internal circumference was one thousand six hundred feet, and the accommodation provided seats for over eighty thousand people. On fair authority it is stated that the Emperor Vespasian caused this theatre to be built, occupying thirty thousand captive Jews in the erection of it. It does not seem, however, to have been completed in Vespasian's reign. Titus, the destroyer of Jerusalem, was he who had the gratification of opening it for Roman sports; and it is said that on the opening day he caused over five thousand wild beasts to be introduced into the arena, and compelled captive Christians to fight with them. Vast cells, or rather ranges of cells, were constructed under the spectators' galleries, for the reception of the wild beasts, panthers, leopards, and lions, which were the combatants in these cruel pastimes. There were also gigantic reservoirs of water containing such supplies, that when occasion required, the floor of the Coliseum could be flooded from them to the depth of several feet; and on the opening day, after the Christians and the beasts had afforded pleasure to Rome, the entire floor was covered with a sheet of water upon which two mimic squadrons performed their evolutions, and went through the performance of a sham naval engagement.

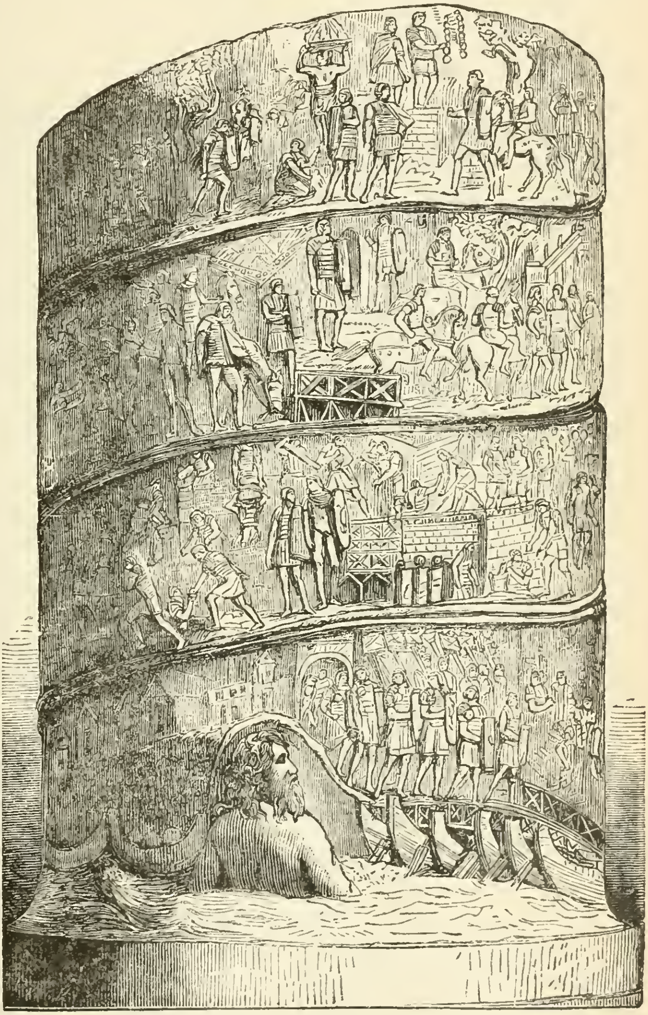


THE RUINS OF THE COLISEUM AT ROME.

For many years the Coliseum was the one great public recreation-place in Rome. Successive emperors exerted themselves to maintain it in all its original splendor, and enormous were the sums of money annually expended upon repairs, and in keeping up the performances. When the Goths sacked Rome they spared the amphitheatre, and until the removal of the seat of imperial government to Constantinople, the Coliseum was preserved in all its integrity. After that event the purposes for which the Coliseum were built were no longer desirable—Christian bishops ruled where pagan emperors had dictated, and the ecclesiastical government was averse to all plays, games, and spectacles—except where it chose specially to have them. The Coliseum's occupation was gone, and its great bulk, and the great store of stone contained in it, proved obnoxious to the desires of certain dignitaries, who, being without palaces, thought the Coliseum might worthily be utilized in furnishing the material for building them. So the Coliseum served in lieu of a quarry till something like half of the Coliseum was swept away, what remained being spared not so much on æsthetic grounds as because of the hugeness of the blocks, which resisted all the efforts of the indolent Italians to move them. On the floor where Corcyrian and Corinthian fleets had manœuvred, great quantities of débris were piled up, so that in course of years the interior was choked with rubbish above the lower galleries on which enthusiastic spectators had sat and applauded.

When Pope Pius VII. was dethroned and taken prisoner by Napoleon I., the Coliseum, in common with many other Roman buildings, was cleaned and cleared. The channels which conducted the water for the aquatic exhibitions, the iron gates which were opened to admit the wild beasts to the arena, and the bronze rings to which the Christian martyrs were chained, were brought to light. It is not possible to say how far the French emperor would have gone on the road of restoration had he continued to direct the fortunes of Italy. He dug out old Rome during the short time his engineers were in the city, and disclosed in all their beauty and reality some of the most splendid monuments of the past. But as soon as the churchmen got back, they undid no small portion of the great emperor's work, actually refilling a large part of the interior of the Coliseum in order to render certain chapels in and about it more accessible. The splendid ruins themselves remain as Napoleon left them; and it is possible they may outlive the ecclesiastical dominion which has despoiled them, as they have outlived the imperial dominion which caused their origin.

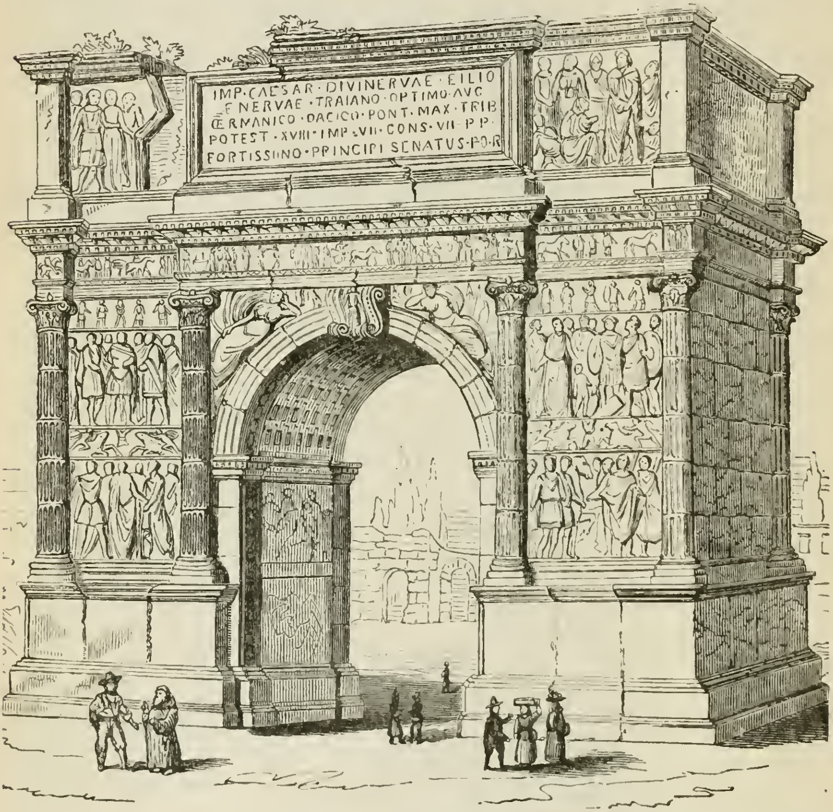
Classical architecture has another remarkable structure. The column of Trajan, erected by that emperor as a decoration to his great Forum, is the finest in the world, and is one of the most perfect works of ancient art that time has spared, it being, with few exceptions, in a high state of preservation. The spot which it occupies was originally cut out of a spur or offshoot of the Quirinal Hill, down to the level of the rest of the Forum, and the height of the column is exactly the same as that portion of the hill which was removed, as stated in the Latin inscription on the pedestal. From this inscription we learn that the monument was erected by the Senate and people of Rome, not only to commemorate the victories of Trajan over the Dacians, but also as a memorial of the height of the hill which it was necessary to cut away in order to make room for the noble structures which adorned the Forum. This height is one hundred and twenty-eight modern feet, exclusive of the bronze statute of St. Peter, eleven or twelve feet high, on its summit, which was placed there by Pope Sixtus V., in the latter part of the sixteenth century, instead of the statue of bronze gilt which had formerly occupied the top, but which had long previously disappeared. The entire shaft of the column is composed of twenty-three blocks of Grecian marble,



THE LOWER TIERS OF TRAJAN'S PILLAR—ROME.

so curiously cemented as to seem but one. The base and the pedestal have nine blocks, the capital one and the basement of the statue one,—making thirty-four blocks of marble in all. The ascent is by a winding staircase of one hundred and eighty-five solid steps of Parian marble, lighted by loopholes.

The column is admirable both for its proportions and for the design and execution of the bas-reliefs and ornaments, which completely cover it. The bas-reliefs ascend in a spiral band, so as not to destroy the line of the shaft by their projection. The whole pillar is encased with sculptures, representing the exploits of Trajan and his army, particularly his triumph over Dacia after fifteen years' war. These sculptures represent pictorially the progress of Trajan's campaign, and are full of details connected with the mode in which the Romans were wont to carry on war; while the representations of the armor and habits of the Romans in the field of battle are most valuable to the classical student. The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THE HISTORIC ARCH OF TRAJAN—ROME.

campaign is depicted from its very opening. The first view, at the bottom of the column, shows the Roman soldiers shipping their stores; others exhibit the army in the work of building camps; the emperor sacrificing for the favor of Jupiter and exhorting his cohorts; the Roman soldiers in conflict with the Dacians, with the various means then employed of defence and attack. The thorough manner in which the Romans appear to have built their stone camps, and the care with which they constructed roads to assist their warlike operations, are strikingly shown. The number of human figures, exclusive of other objects, such as horses, arms and chariots, represented on the shaft, is nearly three thousand. Each of the figures is on an average two feet high. The pedestal is decorated with crowns of victory, garlands and other insignia of triumph.

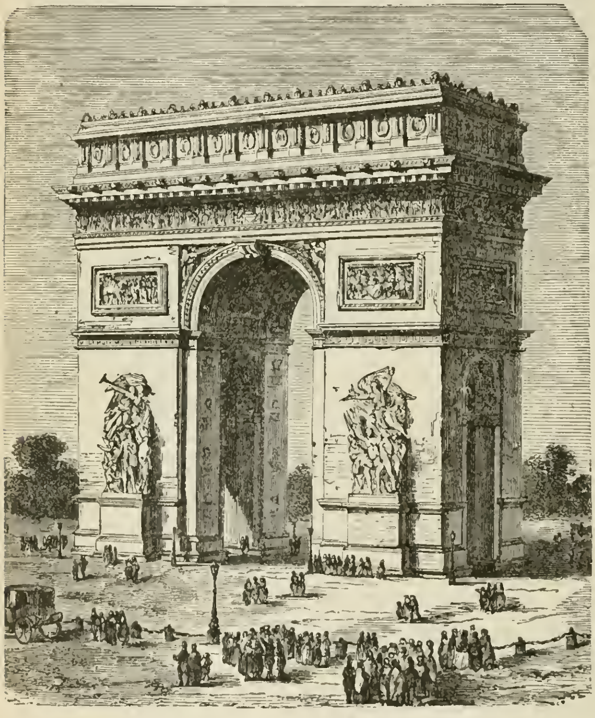
On this pillar, says Gibbon, the veteran soldier contemplated the story of his own campaigns, and by an easy illusion of national vanity, the peaceful citizen associated himself with the honors of the triumph. The column was made by the Emperor Hadrian a place of sepulture for the ashes of Trajan, which, according to a tradition immortalized by Byron, were supposed to have been contained in the head of a spear, or, according to another version, in a globe which the statue of Trajan, placed on the summit of the column, bore in its hand. The general effect of the column, as it stood originally in the centre of Trajan's Forum, surrounded by colonnades, must have been equally grand and picturesque.

The Arch of Trajan is also a conspicuous object among the ruins of the "Eternal City." It is somewhat worn by time, but is still grand and impressive. It commemorates the virtues and exploits of the emperor whose name it bears, and its sculptured designs are so many chapters of Roman history, cut in enduring marble. The foundations of the arch are very massive and are intended to support a structure that shall be permanent. The corner columns, the spacious archway and historical inscriptions are among the most noticeable features of this ancient monument.

The Arch of Triumph, begun by the first Napoleon to celebrate his victories and those of the grand army, is the finest extant structure of its kind. It stands in Paris, at the top of the world-renowned avenue, the Champs Elysées. A striking harmony is visible in its proportions. From a base of one hundred and forty-seven feet, by seventy-five, it rises to a height of one hundred and sixty-two feet. The central archway is ninety-five feet in height. The inner walls are inscribed with the names of ninety-six victories and nearly four hundred generals. It has sculptured decorations of colossal figures representing war scenes.

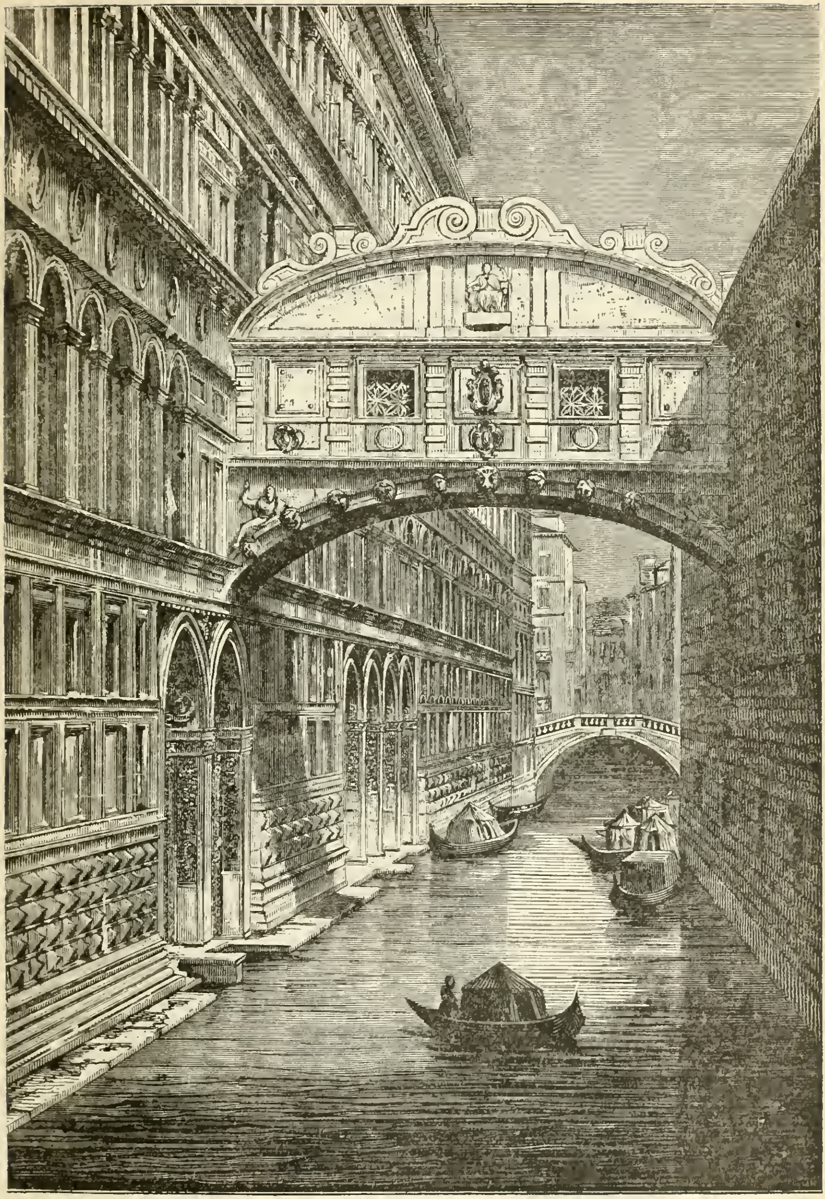
Through this open archway the Emperor William and his retinue passed after the Prussian victory at Sedan. Napoleon conceived the idea of erecting this triumphal monument for his personal glory and that of his army, but what he began was finished at a later period by Louis Phillippe, and at this time the completed structure is one of the finest monuments in Paris.

Passing now to the beautiful city of Venice, the traveler is impressed with the number of objects which present features of a very interesting character. Among these is the celebrated Bridge of Sighs, crossing one of the numerous canals in which that city abounds, and connecting the grand Ducal Palace with the gloomy old prison. The palace and prison face each other, and no contrast between two buildings could be more marked. One is costly, richly ornamented, and abundantly furnished for a home of luxury; the other is dark and forbidding, and possesses all the characteristics of a penitentiary. The bridge which connects the buildings has long been called the Bridge of Sighs, for when a criminal has once crossed it to his dismal dungeon he is apt to leave the world behind him, and no fate could be more unhappy than that to which he is consigned. There the punishment is so severe that it is nothing unusual for criminals to lose their reason and die a lingering death. The narrow cells, the close confinement, the rigid treatment are well fitted to produce despair, and the slow torture is something under which the strongest convicts are almost sure to break down.



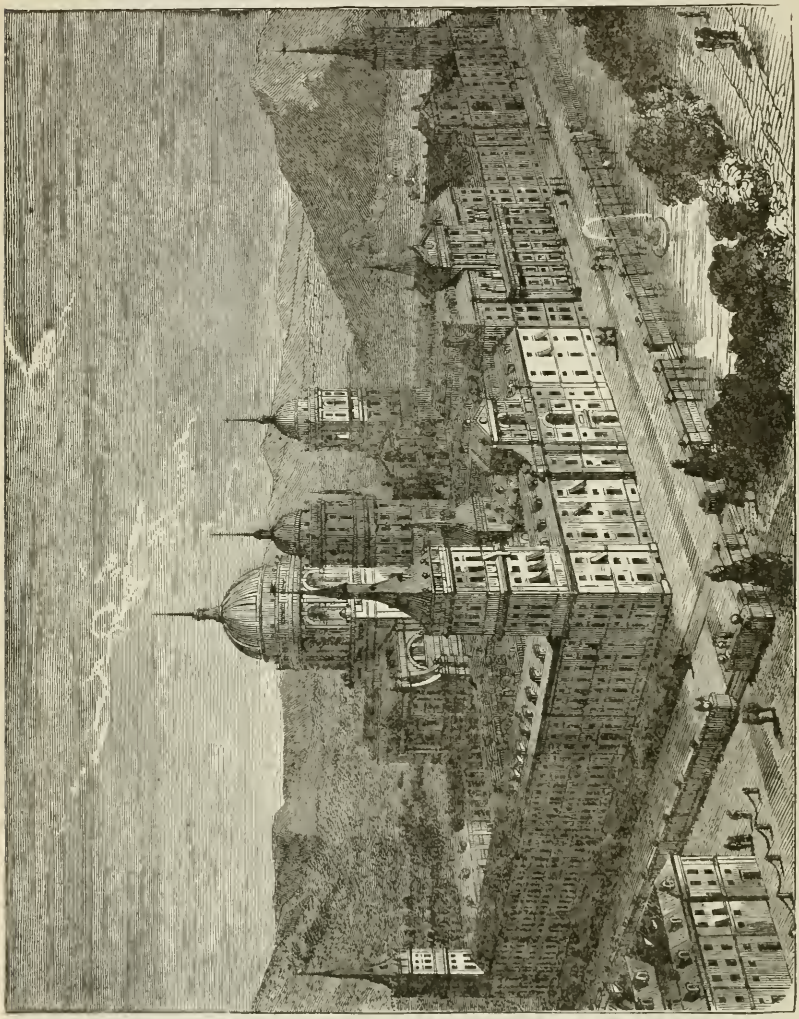
THE ARCH OF TRIUMPHS—PARIS.

Another palace celebrated for its beauty and fine architectural pro-



BRIDGE OF SIGHS, VENICE, SHOWING THE PALACE AND PRISON.

portions is to be found in Spain. The famous palace and monastry of the Escurial stands in the kingdom of Toledo, seven leagues from Madrid. The term Escurial, or Escorial, is considered by some to be Arabic, meaning a place full of rocks; but by others is derived from *scoria ferri*, iron dross, from there having been anciently great iron works near this place. The Spaniards call it *la octava maravilla*, "the eighth wonder," and eccentricity of plan and vast extent entitle it to this distinction. It owes its existence to the bigotry of Phillip the II., who, in his fight with the French at St. Quintin, vowed that if he were



THE WONDERFUL ESCURIAL PALACE—THE RESIDENCE OF THE KINGS OF SPAIN.

successful he would build the most magnificent convent in the world, in honor of the saint whose name should be found that day upon the calendar. The battle being won, it was found that San Lorenzo, or St. Lawrence, was the lucky patron; and measures were forthwith taken for the fulfilment of the vow. According to the legend, this saint suffered death by being broiled on a gridiron; and the architect, Juan Baptista de Toledo, at once took it into his head to build the convent on that singular plan. With this view he represented the several bars by files of building, the handle by a portion of the church, and even the feet by four insignificant towers which rise at the corners. Indeed, the only poetic license he was guilty of, was in supposing his gridiron to be turned upside down. This is confessedly the most wonderful edifice in Europe, whether in dimensions or riches. It has one thousand eight hundred and sixty rooms, six thousand two hundred windows and doors, eighty staircases, seventy-three fountains, forty-eight wine-cellars, eight organs, and fifty-one bells. Its circumference is nearly a mile.

The church is a wonderful structure. The riches of Spain and her ancient colonies are exhausted in the materials—marbles, prophyries, jaspers of infinite variety, and of the most extraordinary beauty, gold, silver, and precious stones; and the splendid effect of the whole is not lessened by a nearer inspection; there is no deception, no false glitter; all is real. The whole of the altar-piece in the Capella Mayor, upwards of ninety feet high and fifty broad, is one mass of jasper, porphyry, and marble. The church has forty chapels, each with its altar; and it is crowned with a dome three hundred and thirty feet high from the ground. There is a mausoleum, encrusted with marbles; the design is in imitation of the Pantheon at Rome. The cost of the Escurial was between seven and eight million dollars. A description of the edifice was translated into English by a servant of the Earl of Sandwich, in his embassy to Spain in 1671, from which it appears that the Escurial was reported to have been destroyed by fire in that year. There was a similar report at a later period.

All the wealth and glory of modern architecture can scarcely furnish a structure equal to one of which history gives us a glowing description. On that part of the ruins of Imperial Rome lying between the Palatine and the Esquiline Hills—a space which was more than a mile in breadth—Nero erected his celebrated "Golden House," as he called the new palace in which he fixed his abode. The vastness of extent and the varied magnificence of this imperial residence and its ornamental grounds, almost surpass belief; and if the details that have come down to us respecting it were not too well authenticated to admit of doubt, they might be regarded as fabulous. Within its enclosure were comprised spacious fields, groves, orchards and vineyards; artificial lakes, hills and dense woods after the manner of a solitude or wilderness. The palace itself consisted of magnificent buildings raised on the shores of the lake. The various wings were united by galleries each a mile in length. The House or immediate dwelling of the emperor was decorated in a style of excessive gorgeousness. It was roofed entirely with golden tiles, and with the same precious metal also the marble sheathing of the walls was profusely decked, being at the same time embellished with ornaments of mother-of-pearl—in those times valued even more highly than gold—and with a profusion of precious stones. The ceilings and woodwork were inlaid with ivory and gold, and the roof of the grand banqueting-hall was constructed to resemble the firmament. It was contrived to have a rotatory motion, so as to imitate the motion of the heavenly bodies. The vaulted ceilings of ivory opened and let fall on the guests a profusion of flowers, and golden pipes sprayed over them the most delicate perfumes.

The vastness of the plan prevented the Golden House of Nero being finished during his lifetime. Vespasian drained the principal lake of this fairy region, on which he built the Coliseum, and pulled down all that Nero had erected beyond the Palatine, reducing the Imperial palace to the hill that once contained Rome. Domitian built up what his predecessor had pulled down, and added to the palace the Adones, or halls and gardens of Adonis, the splendid wonder of that age of magnificence. Septimius Severus made several additions to the south of the Palatine, especially the Septizonium, the site of which has been much disputed; while in later days Pope Sixtus V. carried off to St. Peter's the three orders of columns of which it was composed. Among the modern discoveries of the palace, were a room full of Roman coins, and a hall hung with cloth of gold, and on another part of the Palatine a spacious hall covered with paintings. The fall of the palace of the Cæsars was a true picture of plunder. In the fifth century the Goths pillaged it of all its gold, silver and ivory; its bronze fell to Genseric, and the Vandal is supposed to have freighted a ship with statues from the Imperial palace. In the long feudal wars of the Roman nobles, it was attacked and fortified, taken and retaken; but the Farnese popes and princes gave the finishing stroke to its desolation, to enable them to erect their palaces and villas with its materials.

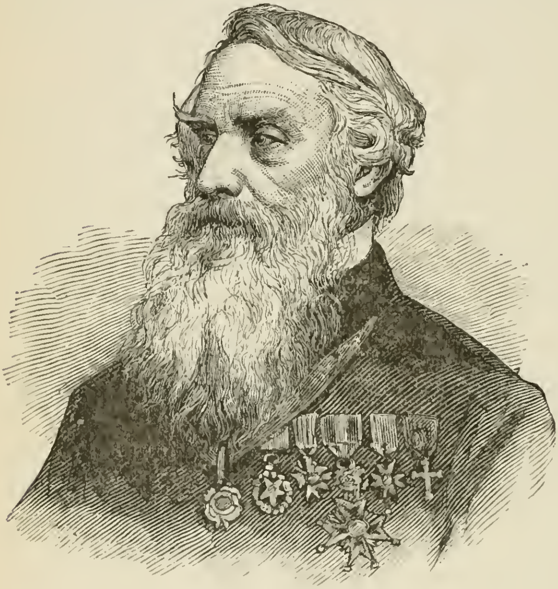
CHAPTER XXII.

WONDERS OF ELECTRICITY.

The Marvelous Magnet—Professor Morse and His Great Discovery—The Atlantic Cable—Broken and Lying at the Bottom of the Sea—Successful Grappling—"The Cable Speaks"—The Electric Light—Edison's Incandescent Burner—Lighting Gas by Electricity—Talking by Lightning—Electro-Plating and Gilding—Magnetic Locomotive—A New Method of Utilizing Waterfalls.

BY magnetism is meant the property that certain native iron ores have of attracting iron. If the tradition generally received is correct, it was an iron ore obtained from Magnesia, in Asia Minor, that was first observed to possess this remarkable property, and hence the name given to it. The mineral itself, in course of time, acquired the name of the loadstone, understood in the sense of a *lead*-stone, or guide.

Long after the discovery of the loadstone, it was found that a bar of iron or steel being rubbed in one direction with it acquired the same property, and, like the ore itself, attracted other pieces of iron. The next step was a very obvious one. To balance a needle, or thin strip of iron, in order that it might be free to follow the attraction of the magnet, would soon occur to any one who amused himself with the loadstone. We can fancy a needle so rubbed being fitted to a straw or bit of wood, and floated in a basin containing water; then, the magnet being drawn round the edge of the basin, much amusement would be caused by the needle following it. The first person who did this stood on the verge of one of those great discoveries to which we owe the advance of civilization itself. The basin, with the needle floating in it, would be left from time to time, when the experimenter grew tired of his amusement, and at last it would not fail to strike him, that he always found the needle pointing in one direction when he returned to it. The first time he would imagine he had left it so. Perhaps, too, his wonder would hardly be excited the second or third time. But once having assured himself that the needle had shifted its position, he would speedily ascertain that it always floated round to one and the same point. It might be a long time before any one discovered that the direction in which it pointed was that of the Polar Star; but when once that wonderful fact was noticed, the basin with the needle in it would be carried joyfully on board ship, as a means of guiding the sailors when the star was obscured, and they could not otherwise have known in what direction to steer. At what date this occurred it is impossible to say. We know, however, that the magnet was employed about three thousand years ago to guide travelers across the plains of Tartary; and about one thousand five hundred years since it was used by the Chinese to navigate vessels in the Indian seas. It was not till the fifteenth century that it was used by European nations; and from that date to the present it has been constantly improved, both by the researches of scientific men, and by the skill of the manufacturers.


INVENTOR OF THE TELEGRAPH.

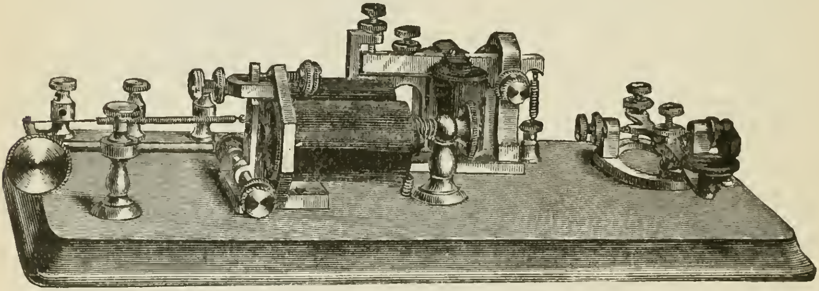
The wonder of the magnet lies in the fact that a piece of iron ore, or a piece of iron that has been rubbed by it, possesses the property of attracting other pieces of iron. So far as magnetism itself extends, we know little, if anything, more than this. The wonder of electricity is, that it seems to exercise or communicate this magnetic property. A magnetic needle, suspended in such a manner that it is free to turn in any direction, takes a position from north to south, with a little deviation. By simply being able to understand the property of this needle, man can steer his course over the vast expanse of the ocean, even when he is unable to see the land. By it, man can traverse the densest forest, or the most dreary desert, when neither sun, moon, nor stars are visible for days and days. Now, we find that, if we have a magnetic needle, and pass a current of electricity parallel to it, the needle is deflected across the current of electricity. Wherever the voltaic force passes through wires stretched from one point to another, it acts upon the needles at the opposite end. This action represents a sign; and by using these signs upon a pre-concerted plan, the messages are sent.

The electric telegraph is now a necessity of the public and private life of every civilized spot upon the globe. It traverses all lands and all seas. The forty miles of wire with which it started from Washington City have become many millions. Its length of line in the United States is about the same with that of the mail-routes, and a similar equality probably obtains in other parts of the world. We have nearly as much line as all Europe together, though the extent of wire may not be so great. It is little to say that this continent, so dim to the founders of the Union, has been by the invention of Morse compressed within whispering distance, the same advantage having been conferred on other countries. It is the property of mankind, and the comparison must be between present and past, not between any two countries of the present. Strictly, a comparison is not possible, nothing like magnetic communication having been known forty years ago, unless to the half imagination, half realization of one or two closet experimenters. Steam and stamps wrought a difference in degree—the telegraph one of kind. Against eighteen hundred miles of wagon-road we set seventy-three thousand of railway; but two hundred thousand miles of telegraph are opposed by nothing, unless by Franklin's kite-string. Looked at along the perspective of poles, the old days disappear entirely—the patriots become pre-historic. Yet modern self-conceit is somewhat checked by the reflection that the career of these two great agents of intercommunication has but just opened; that their management even yet remains a puzzle to us; and that the next generation may wonder how we happened to get hold of implements whose use and capabilities we so poorly comprehended. So far as prediction can now be ventured, a force and pathway more economical than coal and the rail will not soon be forthcoming; nor is Canton apt to "interview" New York at the rate of more words in a minute over a single wire than she can now. Some day dynamite may be harnessed to the balloon, which stands, or drifts, where it did with Mongolfier, and we may all become long-range projectiles; but even this age of hurry will contentedly wait a little for that.

A room was furnished Professor Morse at the Capitol for his experimental operations in extending his wires to Baltimore: and among the first messages ever transmitted over them was the announcement of the nomination of Mr. Polk for the Presidency.

Morse's system, with slight modifications, is now employed throughout the civilized world. In addition to a number of well used systems of duplex—sending a message in one direction on a wire while another message is being sent in the opposite direction on the same wire—and likewise a multiplication of this, as shown in the quadruplex and sextiplex, which are becoming common, a system of multiplex has just been perfected and is now in operation between Boston and Providence, by which, it is claimed, seventy-two messages may be sent over the same wire at the same time, and in the same direction at the rate of three words per minute for each circuit; or thirty-six messages, if sent in opposite directions.

Wonderful as the telegraph is when stretched thousands of miles over land, bringing Boston and San Francisco within speaking distance of each other, even this is surpassed by the ocean cable, that marvelous construction which shrinks the sea to a rivulet. It was while turning round a globe, and meditating on a proposition for a telegraph from Newfoundland to New York, that a young merchant, who had retired from business with an ample fortune, was led to ask himself the question, why should not there be a wire across the Atlantic Ocean itself? The subject had occupied other people's minds; and Lieutenant Berryman, sent out by the Navy Department to study winds and currents, had already reported the existence of the deep sea plateau. Accordingly, when Mr. Field wrote to the National Observatory at Washington to ask for scientific advice as to the feasibility of the telegraph scheme, Lieutenant Maury answered,—"Singularly enough, just as I received your letter I was closing one to the Secretary of the Navy on the same subject." He inclosed a copy of this official letter, and it contained the following remarkable words:—"Whether it would be better to lead the wires from Newfoundland or Labrador is not now the question; nor do I pretend to consider the question as to the possibility of finding a time calm enough, the sea smooth enough, a wire long enough, a ship big enough, to lay a coil of wire sixteen hundred miles in length. A wire laid across from either of the above-named places on this side will pass to the north of the Grand Banks, and rest on that beautiful plateau to which I have alluded, and where the waters of the sea appear to be as quiet and as completely at rest as it is at the bottom of a mill-pond." Strange that this beautiful plateau should occur at the narrowest part



ELECTRO TELEGRAPH MACHINERY.

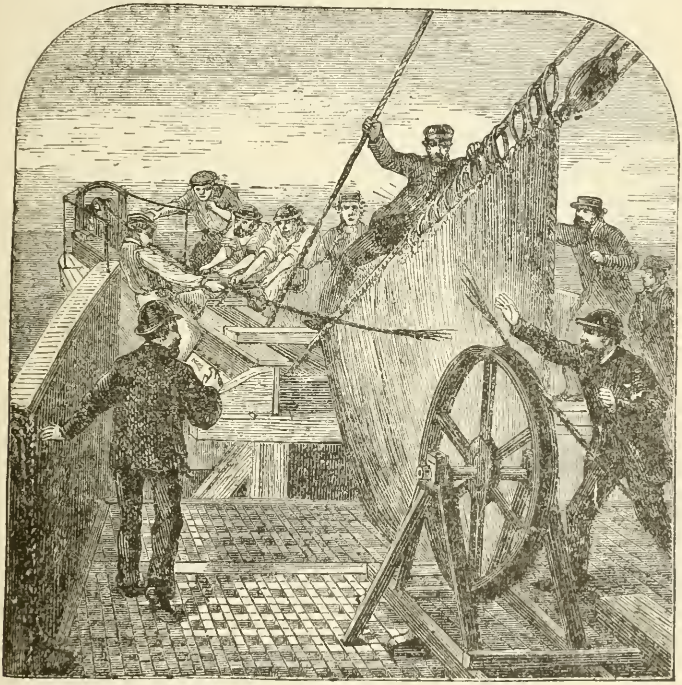
of the ocean, and between countries which are both occupied by energetic Anglo-Saxons! Here then was sufficient encouragement. Other men, to whom science was a regular pursuit, had prepared the course, Cyrus Field was the man to run the race. He at once set to work with extraordinary energy, and, with his own example to back his arguments, succeeded in inducing four other men of large fortune to enlist themselves in the enterprise. With some little trouble a very liberal charter was obtained from the Government of Newfoundland, and at six o'clock, one Monday morning, at the house of Mr. Cyrus Field's brother, a company was organized with five directors, the charter was formally accepted, and a capital of a million and a half of dollars was subscribed.

The cable consisted of the following elements: a copper conductor, composed of seven No. 18 wires twisted together into a strand, the weight per nautical mile being three hundred pounds, or three hundred and eight tons to complete the whole length, which was two thousand three hundred miles as coiled on board; an insulating wrapper of gutta-percha, laid on in four thin layers, with a .compound between each, called Chatterton's Compound, the weight per mile being four hundred pounds; a padding of jute yarn, saturated with a preservative compound, wrapped round the gutta-percha; and outside this, ten solid wires, No. 13 gauge, of homogeneous iron, each wire being separately surrounded with Manilla yarn steeped in a preservative compound. The weight of the finished cable was 35 cwt. 3 qrs. per nautical mile in air, and only 14 cwt. in water, showing a very low specific gravity. The cable was calculated to bear a strain of nearly eight tons before breaking, and hence would support eleven miles of itself hanging vertically over a ship's stern. The total weight of deep-sea cable coiled on board the "Great Eastern" in 1865 amounted to four thousand one hundred and eleven tons.

The first attempt to lay an Atlantic cable was a failure, but American enterprise and genius were not to be defeated. In 1865, a cable having been constructed and made as nearly perfect as possible by the use of the best materials, and by the most approved method of insulation, the steamship "Great Eastern," freighted with it, sailed from Valentia on the twenty-third of July. On the second day after starting from the Irish coast, a fault in the electric insulation of the cable was detected; a tiny piece of loose iron wire had forced its way through the outer covering and the gutta-percha surrounding the electric wire, so as to come in contact with the latter; and, when this piece was cut out and a new splice made, the fault was effectually cured. The cable had again to be raised and examined in the same way, on the twenty-ninth, when the ship was in two thousand fathom water, six hundred and thirty-six miles from Valentia, and one thousand and twenty eight miles from Newfoundland. A total loss of electric insulation, or "dead earth," as it is called, was discovered about one o'clock that afternoon. The ship was stopped at once, and as soon as the picking-up machinery could be put in gear, the end of the cable was hauled in again over the bows, and the faulty portion having been cut off and laid aside for a minute examination, the remainder was spliced afresh, and the operation of paying-out over the stern of the ship was recommenced next morning.

Soon after this it became necessary to "pick up" the cable to remedy a defect which the instruments had detected, when that memorable accident occurred which taxed the ingenuity of those on board to remedy it. The cable and the wire rope together were coming in over the bows in the groove in the larger wheel, the cable being wound upon a drum behind by the machinery, which was once more in motion, and the wire rope being taken in round the capstan. Still, the rope and cable were not coming up in a right line, but were being hauled in, with a great strain on them, at an angle from the right-hand side, so that they did not work directly in the V in the wheel. Still, up they came. The strain was shown on the dynamometer to be very high, but not near breaking-point. At last, up came the cable and wire rope shackling together on the V-wheel in the bow. They were wound round on it, slowly, and were passing over the wheel together, the first damaged part being inboard, when a jar was given to the dynamometer, which flew up from sixty cwt.—the highest point marked—with a sudden jerk, three and a half inches. In fact, the chain shackle and wire rope clambered, as it were, up out of the groove on the right-hand side of the V of the wheel, got on the top of the rim of the V-wheel, and rushed down with a crash on the smaller wheel, giving, no doubt, a severe shock to the cable to which it was attached. The machinery was still in motion, the cable and the rope traveled aft together, one towards the capstan, the other towards the drum, when, just as the cable reached the dynamometer, it parted, thirty feet from the bow, and with one bound leaped, as it were, into the sea.

For a moment dismay seized those on board. They were startled at the thought that the cable had parted and dropped into the sea. Nothing was to be done but to adjust the grappling apparatus and search for the lost treasure. At first the iron sank but slowly, but soon the picking-up machinery lowered length after length over cog-wheel and drum, till the iron wires, warming with work, heated at last so as to convert the water thrown upon the machinery into clouds of steam. Still the rope descended, and the strain was diminished, when at two thousand five hundred fathoms, or fifteen thousand feet, the grapnel reached the bed of the Atlantic; and as the ship drifted across the course of the cable, there was just a surmise that the grapnel might catch it. In the search from August third to August eleventh, the cable was grappled three times; it was lifted each time a considerable way from the bottom, but the grapnel, ropes, and lifting machinery, were not sufficient to bring it to the surface. Nearly twelve hundred miles of the cable now lay along the bed of the Atlantic Ocean; one end attached to the shore at Valentia, the other submerged under nineteen hundred and fifty fathoms of water, and resting on a soft, oozy bottom. A length of fifty-five hundred miles of cable altogether had been made for this great Atlantic enterprise from 1857 to 1865, and nearly four thousand miles had been swallowed up in the ocean; a million and a quarter had been sunk; but the grand hopes were not crushed. The various telegraphic companies interested in the completion of the undertaking wisely concluded to resume operations forthwith.



SUDDEN BREAK OF THE CABLE ON BOARD THE GREAT EASTERN.

The storms of twelve months had passed over the cable before the preparations were complete; that it had not drifted was thoroughly believed. The naval commanders had made accurate observation of the exact latitude and longitude of the spot where the end of the cable finally disappeared in August, 1865; and, as the same nautical instruments, applied in the same way, would find the same spot again, this was the test, and the only test relied on. The "Great Eastern" arrived on the twelfth of August at the cable-fishing ground. We have not space to detail the series of snatchings, losings, raisings and breakings, dodgings and fishings, of the vessels engaged in this cable-craft, but pass on to the sixteenth, when while hauling up the grapnel, the splice between the grapnel-rope and the buoy-rope broke, and down went rope, grapnel, cable, and all. The position being a good one, another grapnel was put forth; it was dragged; the strain on the dynamometer (the instrument that shows the amount of force or weight pulling at the grapnel-rope, in addition to its own weight) indicated that the grapnel had got hold of the cable; it was hauled in; and lo! on the seventeenth up came to sight the actual cable itself! Nearly every one on board the ship crowded to the bows to see the grapnel come up over the water. The lost cable of 1865, lifted from its oozy bed two miles beneath the surface of the Atlantic Ocean, now made its appearance, attached to the flukes of the grapnel, amid a spontaneous cheer; the sound of this, however, had scarcely passed away, when the fact became known that the cable had quietly and easily disengaged itself from the flukes and springs of the grapnel.

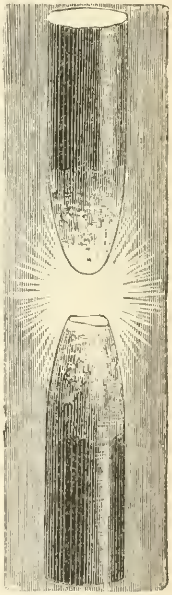
The cable was found, not merely bodily, but with all its electric qualities in full efficiency. The cable itself told the tale. There it was—the copper in the middle, then the gutta percha, then the iron wires and then the outer covering of Manilla hemp. The problem to be solved was, whether the cable after being twelve months at the bottom of the Atlantic, would transmit an electric message to Valentia. An operator applied the end of the cable to his delicate instruments, amid the breathless silence of those around him. Presently he took off his hat and gave a cheer—the cable spoke!

THE BRILLIANT ELECTRIC LIGHT.

But the wonders of electricity are not exhausted by the telegraph. The problem, long-studied by scientists, of procuring from this subtle force in nature a light that would be of service and outstrip all other means of illumination has been solved, and in every town now, of any dimensions, electric lighting is in successful operation.

Pure incandescence is represented by four systems—Edison, Maxim, Swan and Lane Fox. The light from this description of lamp is from the heating of a carbon filament due to its high resistance to the passage of the current. This filament is surrounded by a hermetically sealed glass bulb from which all the air has been extracted. The life of the lamp depends greatly as to how carefully this process has been carried on. It is not sufficient only to extract the air when the lamp is cold, but the process must be carried on when the lamp is burning, and the exhaustion must be continuous for some time. These lamps can be worked either by an alternating or a continuous current machine; and, unlike those of partial incandescence, require a tension current, while the former work best with a quantity one.

The Edison lamp is generally considered to be the pioneer of this system of illumination. Whether this be so or not the name of the inventor has been for a considerable time associated with lighting by incandescence, although his early experiments were with a lamp containing a metallic substance. As at present manufactured, the lamp consists of a blown glass globe containing a very fine filament made from the fibre of bamboo carbonized. The length is fixed according to the resistance required. Each end of the filament is nipped between a miniature vise composed of platinum connected with the terminals of the lamp. These are fixed in an insulated socket, which also holds the glass bulb. The socket is furnished with a screw which fits into a projection on the bracket or holder, so that the act of screwing in the lamp makes the necessary connection with the conducting wires. By turning a tap the lamp can be removed without interrupting the passage of the current. The maximum duration of the lamp is stated to be twelve hundred hours. The chief feature of the Edison system is the manner in which the inventor distributes the current from a main generator of his own design, which is always used with this system of lighting.


THE VOLTAIC ARC.

The engraving on next page is a perfect representation of Edison's latest electric lamp, with its various parts shown in detail. Fig. 1 shows the carbon horseshoe ready for use, full size; Fig. 2 represents the horseshoe when just cut from the Bristol board, illustrating, by its comparison with Fig. 1, the enormous shrinkage it undergoes during the process of carbonization. The only index to the completion of this process is the crackling of the oxide formed on the exterior of the iron boxes in which the horseshoes are placed. After their removal from the boxes the carbons are placed between the jaws of small platinum vises, *a*, *a*, supported on thin platinum wires blown in the glass base and forming the electrodes. The inventor has so improved the Sprengel air-pump, that high vacua may be produced in twenty-five minutes instead of the enormous time consumed by some of our physicists. The resistance of the slender carbon horseshoe is one hundred ohms.; and while the lamp shown, Fig. 3, is intended to give a light equivalent to a single four foot gas jet, it may be forced to give a light equal to eight or ten of such jets. The carbons are so tough that one of them has been subjected to the test of applying and removing the electric current a num-

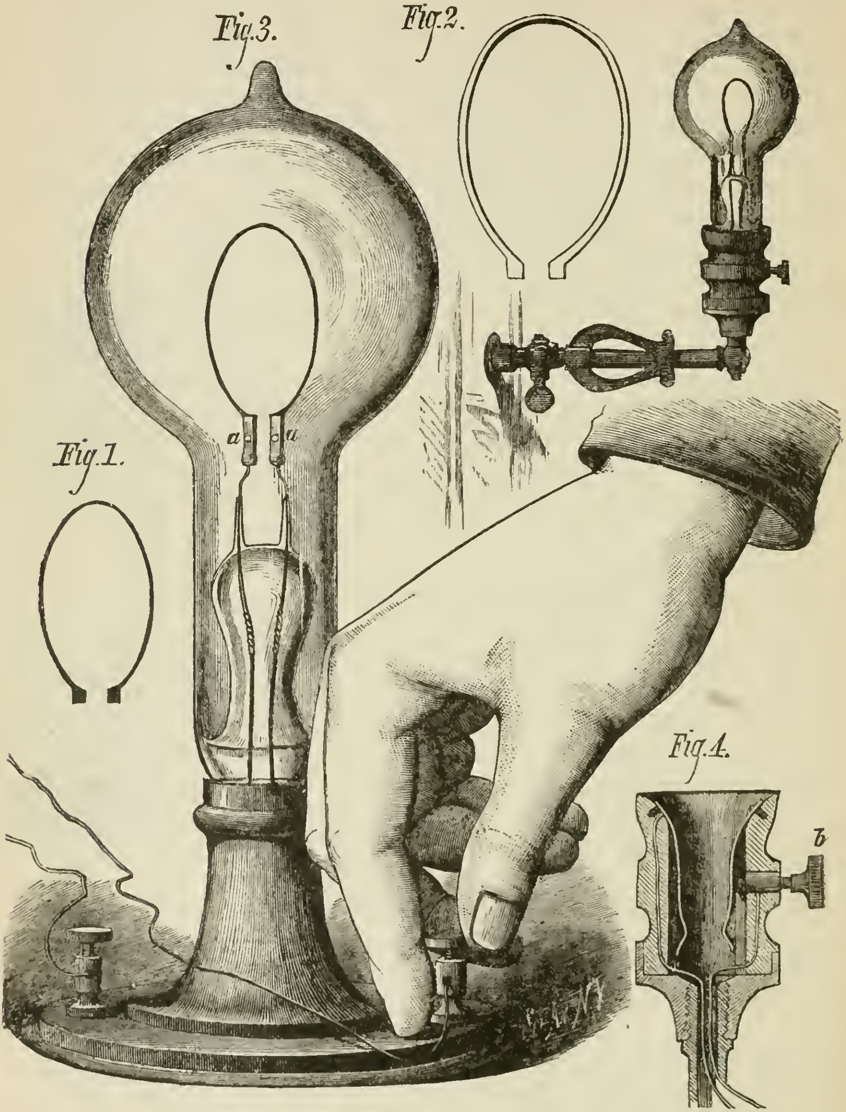
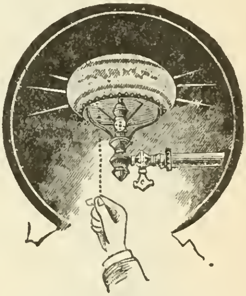


Fig.3.
Fig.2.
Fig.1.
a
a
Fig.4.
b

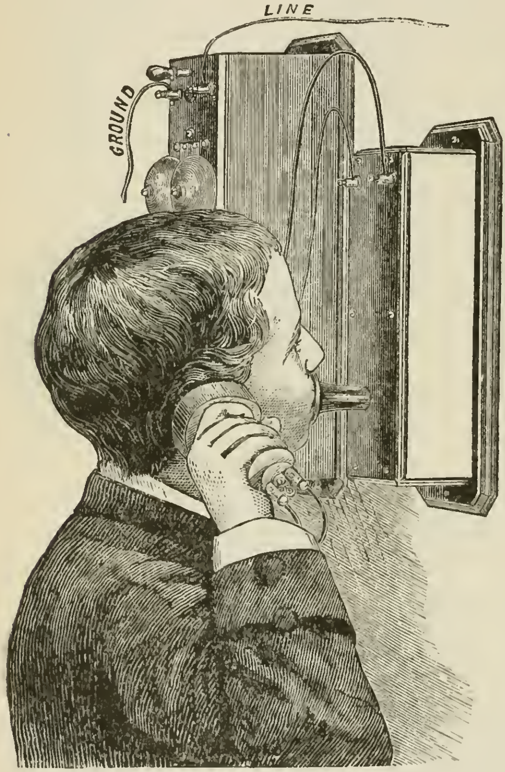
EDISON'S MARVELOUS INCANDESCENT LAMP.

ber of times equivalent to thirty-six years of actual daily use, and without being in the least impaired. The horshoe form of the carbon has a great advantage over the voltaic arc, the light being softer, more diffused and less trying to the eyes. It is, besides, perfectly uniform and steady. The lamps are connected in multiple arc, that is, the two wires leading from the electrical generator run parallel to each other, and the lamps are placed between them and are connected with each wire. The entire lighting apparatus of any building consists in the lamps and a few wires. The lamp in its present form is as simple and as easily handled as a candle, and can be taken from its socket and replaced even while the current is on. The construction of this socket is shown in Fig. 4. The lamp has, attached to its electrodes, slips of copper which are bent up against the sides of the glass, touching two springs at opposite sides of the socket. One of these springs is connected with one of the electrical conductors; the other merely touches the copper strip, and does not form a part of the electrical conductor until it is touched by the thumb-screw, *b*, this latter being connected with the second electrical conducting wire. To start the light it is only necessary to turn the screw, *b*, till it touches the spring. To stop the light the screw is turned in the reverse direction. From this it is obvious that an electric lamp is more easily managed than a gas burner, as it requires neither lighting nor regulating; while it is equally plain that if these lamps withstand the test of time, the inventor has solved a profound problem, and become one of the world's great benefactors.


LIGHTING BY A CHAIN.

A simple apparatus has been constructed for lighting gas by electricity, which is, nevertheless, ingenious and convenient. Through the house the wires are placed under the plaster and are hidden away out of sight. In residences the system is to run a wire from the cellar, or where the battery and spark coil are, to each gas fixture. The burners are of an especial kind made for this method of lighting. Wires are run from these burners to a double press button on the wall, or suspended over the bedstead. By touching the white knob of the button, electricity is made to move a magnet which turns on the gas in the burner and makes at the same time a spark which lights it. Touching the dark knob of the button shuts off the gas in the burner in the same way. In another form where the burner can be easily reached, the gas is lighted by pulling a little chain which hangs down out of the globe. Two battery points create the spark.

That we should ever be able to "talk by lightning" was not dreamed of for many years after the discovery of the telegraph proved that messages could be transmitted through motions of the electric instrument producing signs. Now we do not have to write the communication, but can speak to a person many miles away, and converse almost as freely as we would with one by our side in the same room. The principle is that of the transmission of sound. The air, the water, woods, metals are all conductors, but it has been proved that a metallic conductor, a telegraphic wire, with electricity for the driving force, is the best transmitter ever discovered. The telephone has rapidly sprung into use, and has become a necessity in our large towns, where, on account of the pressure of business, time is money and moments count for as much as hours did once. A man of business can call up his neighbor, who is near, or his customer miles away, and in a brief time the matter in hand is disposed of.

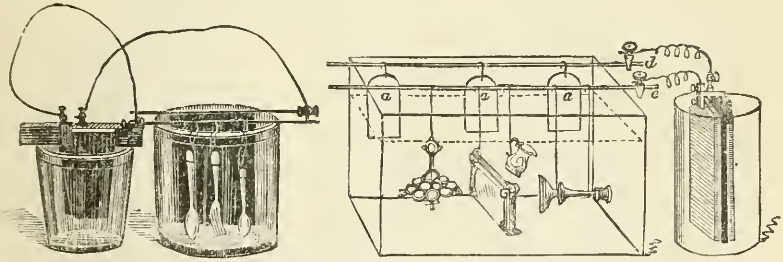


THE FAMOUS BELL TELEPHONE.

The description of the instrument is as follows: an electro-magnet or spool of copper wire is fastened to the end of a steel bar which has been charged with magnetism; the ends of the wire are carried down to the outer part of the rubber case, and connected by screws to the line wire. In front of the spool, and a little way from the end of the bar magnet, a piece of "ferrotype" sheet iron is placed. When a current of electricity is sent into the telephone and through the spool of wire, the sheet iron plate is caused to vibrate in unison with the breaking of the current, by reason of the alternate attractions and cessations of attraction of the plate by the electro-magnet, and a sound is produced.

Electricity has also been applied to art in various ways, and the galvanic battery is as indispensable for various manufacturing purposes as the steam-engine is for others. Especially is electricity employed in the art of plating and gilding.

Silver-plating is done in the following manner: a chemical solution of silver is placed in a glass or trough. Into this solution are placed a piece of silver and the article to be plated, the silver being attached to the positive pole and the article to the negative pole of the battery. When the battery is put in operation, the silver in solution is carried by the current to the negative pole and deposited upon the article, giving it a dead or frosted appearance. If, however, it is desired to polish the article, a few drops of bi-sulphide of carbon are put in the bath and have the effect of giving the plating a lustre. It is necessary to have the articles perfectly clean to give them a durable coating. This is accomplished by first putting them in a boiling solution of potash to remove all grease from them. They are next dipped into a weak solution of nitric acid to remove any canker that may be on them, after which they are washed thoroughly.



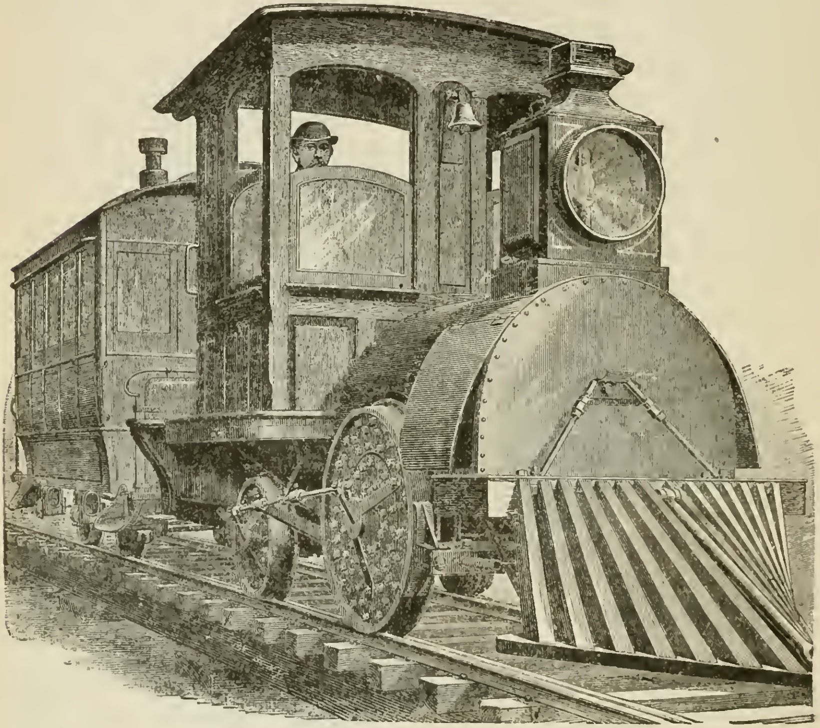
ELECTRO-PLATING APPARATUS.

A single, double or triple plate is formed according to the length of time the operation goes on. From three to six hours is the usual time required to give a good plating. One half ounce of silver to the square foot makes an excellent plate. After the desired plate is given to the article, it is brushed well with a fine brass wire brush, which is revolved by a lathe. Finally, it is cleaned with fine Calais sand and polished. Gilding is done in much the same way, the principle being the same.

Electro-motive power is produced by the great attractive power of the electro-magnet; that is a magnet formed by passing a current of galvanic electricity through a bar of soft iron. The first electro-motor, large enough for any practical use, was constructed by the celebrated Russian, Philos Jacobi. In 1839, by the use of one of these motors, he propelled a boat, carrying ten persons, at the rate of four miles an hour. He obtained his electrical force from a powerful galvanic battery.

The electric motor is made by putting a ring of soft iron, or armature as it is called, between the poles or ends of a horseshoe magnet. The armature is then said to be in the field of the magnet, and is made to revolve by passing a current of electricity through the magnet.

In one of the forms lately presented, there is a hinge in the back or curve of the magnet, and the armature is made to revolve rapidly or slowly by bringing the poles or ends of the magnet near it, or removing them from it by means of a thumb screw. Generally the speed is controlled by regulating the amount of current fed to the motor. A wheel is placed on the end of the armature, and in this way a sewing or other machine is belted on to it and set in motion.



THE WONDERFUL MAGNETIC ENGINE.

The motor has the advantages of being noiseless in its action, can be easily moved from one place to another, is safe, easily controlled and free from dirt. It is very finely adapted to the manufacture of mathematical, optical and other delicate instruments. The impression that the great attractive power of the electro-magnet could be profitably applied to machinery was so great at one time that an appropriation of

$20,000 was made by Congress, and one of $120,000 was made by Russia to experiment in this direction. A great many machines were invented for using it as a motive power, but in no case was it found to be so economical and efficient as steam.

In motor work, first coal is burned to run the steam engine, which by belts or by direct connection of the shaft, revolves the bobbin of the dynamo electric machine, and thus creates a current. The motor is then connected by wires to this current which causes its armature to revolve and do the work by directly turning the drill or by further belting, putting in motion other forms of machinery. It is therefore readily seen how, in so much re-transmitting of the power from the coal pile to the drill, sewing machine, or engine, much loss must necessarily be sustained.

Street railways are adopting this form of power and in some places seem to be successful. In one system proposed, the rails are used to carry the electricity from the home station. All along the road the cars get the power by carrying the current through their wheels to motors on the cars. The motor causes the car axle to revolve and so runs the car. The fact that electrical force can be conducted great distances suggests the possibility of utilizing waterfalls to run the dynamo to generate the electricity, which can be conducted to motors in factories miles distant.

CHAPTER XXIII.

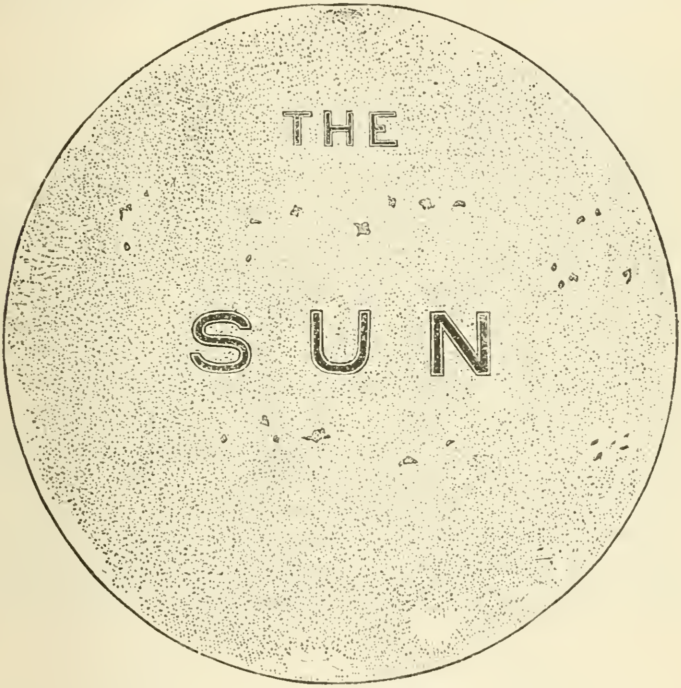
WONDERS OF ASTRONOMY.

Vastness of Space—Curious Sun Spots—Amazing Distance and Bulk of the Sun—Brilliant Constellations—Distances of the Fixed Stars—Falling Fire-Balls—Mysterious Nebulæ—Singular Freaks of Comets—The Immense Comet of 1843—The Earth Passing Through the Tail of a Comet.

A WISE man only wonders once in his life, but that is always; the fool never. The education of the wise man begins with wonder, and ends with devout admiration; but the fool "doth not consider," and shuts his eyes to things around him. Strictly speaking, wonder is not a vulgar nor a foolish attribute. All wonder, said a dogmatic writer, is but the effect of novelty upon ignorance. Nay, we answer, you cannot be ignorant if you would feel the greatest effect of wonder. Thus it is that, Coleridge, a most learned man, declares, "in wonder all philosophy began, in wonder it ends, and admiration fills the interspace; but if the first wonder is the offspring of ignorance, the last is the parent of adoration."

Let us consider shortly one of the commonest wonders about us—space. Gaze up into the sky from off the page you are reading, and try to pierce as far as your eye can reach, and then as far as your mind can conceive. Our globe—the speck of dust on which we stand—is eight thousand miles in diameter, or twenty-four thousand miles in circumference; but with its sun, planets, and satellites, and those "less intelligible orbs called comets," it occupies space, which, calculated only by the uttermost bound of the orbit of Uranus—and we know that beyond Uranus there are worlds—is not less than three thousand six hundred millions of miles in diameter. The mind, it has well been said, fails to comprehend so vast an area. Some faint idea of this, says an eloquent writer, can be obtained from the fact that, if the swiftest racehorse ever known had begun to traverse it at full speed at the time of the birth of Moses, or nearly four thousand years ago, he would as yet have accomplished only half his journey!

The sun, which so many have worshiped, and which is, humanly speaking, the source of life to us all, is another perpetual wonder. Its circumference is about two million seven hundred and seventy thousand miles. Its distance from the earth is so great that a railway train moving at thirty-two miles per hour would take three millions of hours, or three hundred and forty-two years and three months, to travel from us to the sun, supposing that it could travel incessantly night and day during that time. A cannon ball, moving fifty times faster than such a train, would expend seven years in reaching it. To make a globe like the sun it would take one million four hundred thousand globes like the earth rolled into one! Or, to make these facts simpler, and yet more stupendous, the bulk of the sun is five hundred times greater than the aggregate bulk of all the other bodies of the solar system of which night only reveals to us a small part—that which appears above our hemisphere, and above our particular stand-point. The centre of the sun is a dark mass covered with a garment of flame. But in this luminous matter there are vast rents. We talk of spots in the sun; spots indeed! the space occupied or laid bare by the principal spot is nine hundred and twenty-eight million square geographical miles. Arago, by a physical test, proved that this garment of flame, this luminous matter, must be gaseous; so that the sun floats in an ocean of flame, and this is so powerful that the strongest blast furnace yet



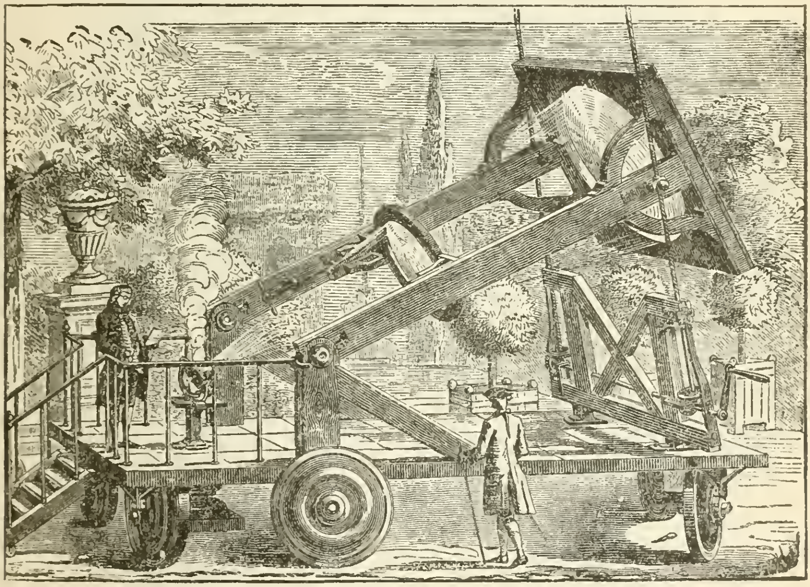
THE SUN AND ITS WONDERFUL SPOTS.

ignited by man, at its highest power, is seven times weaker than the sun's heat at its surface. If the heat be electric, how great is the wonder! being dispersed over space so great that the earth's surface, at a distance of ninety-five million miles, notwithstanding the alternation of night, receives in a year sufficient, if uniformly diffused, to liquefy a crust of ice one hundred feet in thickness.

When we come to examine the sun by the aid of a telescope, we find that all parts of the surface do not give out light to the same extent, and that there are certain places on it darker, and some brighter, than the remainder of the disc. The former are called sunspots, the latter faculæ, which are always associated with spots.

The first person who examined sunspots closely was the illustrious Galileo, who proceeded to determine from them the sun's velocity of rotation on his axis; for he perceived that they moved across the sun's body. However, since his time, it has been shown that the spots have a motion of their own; those at the sun's equator moving faster than those at his poles; so that observations on the spots alone cannot tell us the rapidity of the revolution of the sun's entire mass. It has also been noticed that the number of these spots visible at one time does not remain the same from year to year, and, in fact, that about every ten years there is an epoch at which they are especially abundant. General Sabine has pointed out that these periods of frequency of sunspots are coincident with the periods of greatest magnetic disturbance on our own globe. Accordingly, we see that there exists a distinct and close connection between variations in the appearance of the sun, and changes in the physical constitution of our earth.

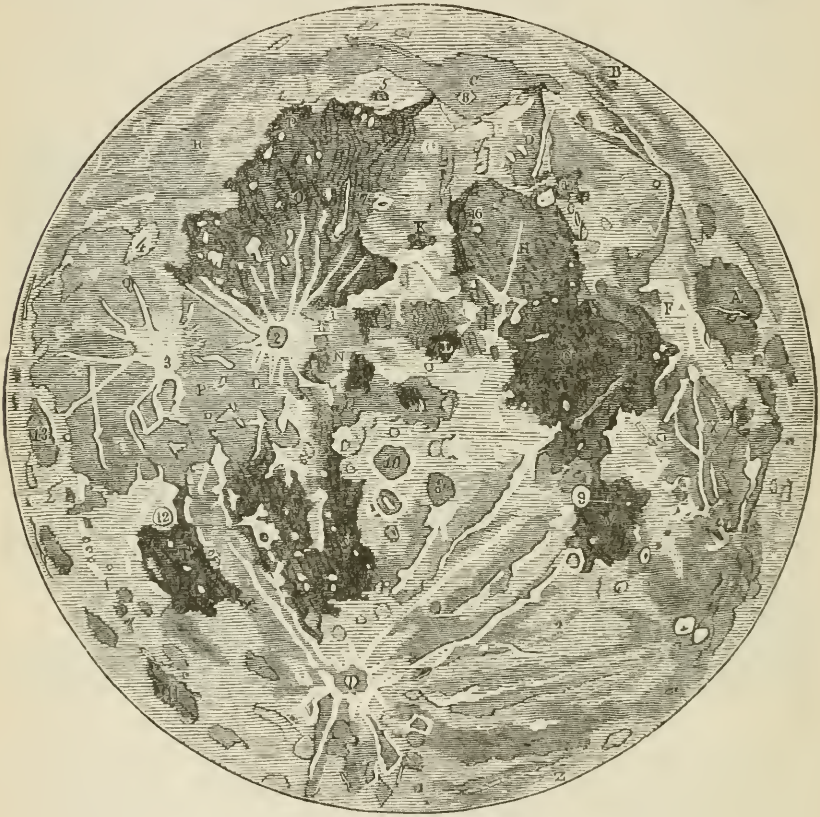
The interesting question now arises: what are the sunspots? and what is their cause? The very careful investigations of science have thrown much light upon this interesting subject. One of the most remarkable features of the spots is, that their central portion is darker than the edge; and accordingly, nearly a century ago, it was suggested that they were pits in an envelope which surrounded the sun. The results of later experiments seem to confirm this idea. They further go to show that the faculæ, or bright patches, are really of the nature of luminous clouds, placed, relatively to the sun, above the level of the spots. These faculæ are generally seen behind the spot, a position which they would necessarily assume if they were thrown up to a greater distance from his centre, and would move more slowly. The same observations have shown that spots are produced below the level of the sun's photosphere, while the faculæ are suspended in that medium. If this be admitted, it seems to follow that the two phenomena are effects of a vertical circulation in the gaseous matter surrounding the sun, the faculæ being produced when a portion somewhat denser than the medium in which it is suspended is raised into or above the photosphere, while spots are observed when such a mass is below the photospheric stratum. In fact, one of our most diligent sun observers has seen a faculæ, apparently in the act of sinking, lose its brightness and gradually pass into a spot, its form remaining unchanged during the process. There is a shorter period of twenty months' duration observable in the recurrence of spots, and this coincides with the periods of recurrence of the same relative position of Venus as regards the sun and the earth. A similar relation between Jupiter and the sun is also indicated. These discoveries are of the very greatest interest, as they show us how intimately all the bodies of our solar system are related to each other, and how the slightest change in any one of them exerts a definite influence on the condition of the entire system, despite the great magnitude and the distance from each other of the bodies which compose it.



BERNIERES' IMMENSE BURNING-GLASS.

The burning-glass has long been used for the purpose of producing combustion. The rays of the sun are concentrated by means of a concave lens, and with a lens of sufficient power all combustible substances can be ignited.

The curious in figures, and readers who have a higher aim, will be interested to know that a railway train at the average speed of thirty miles an hour, continuously maintained, would arrive at the moon in eleven months, but would not reach the sun in less than three hundred and fifty-two years. When arrived, it would be rather more than a year and a half in reaching the sun's centre; three years and a quarter in passing through the sun, supposing it was tunnelled through, and ten years and one-eighth in going round it. How great these dimensions are, may be conceived from the statement, that the same train would attain the centre of the earth in five days and a half, pass through it in eleven days, and go round it in thirty-seven days.



TELESCOPIC VIEW OF THE MOON.

It seems strange to say that the geography of the moon, or at least of much of that portion of her surface which is presented to our view, is better known than that of many parts of our own earth; and yet this is quite true. Our telescopes are of such power that if there were an object on the moon's surface as large as the Capitol at Washington, they would infallibly reveal it to us. Most elaborate maps of the moon have been made, and it has been satisfactorily proven that she herself is a solid body, probably composed of rocks much like those on our planet, but not provided either with water or with any trace of an atmosphere. It presents the appearance of a burnt globe or body of volcanic matter.

Persons who have the opportunity of looking at the heavens through a telescope of the greatest power, should always ask to be shown a "globular cluster." There is no object in the sky which can compare with these systems in respect to the sublimity of the ideas which their contemplation evokes. There are about a dozen of these wonderful clusters of stars known to astronomers. One or two of these clusters can be faintly seen with the naked eye on a very dark night, as a minute spot of light on the black sky. The others are totally invisible without the aid of a telescope.

These bodies, or rather congregations of bodies, are small in apparent size; that is to say, they are not nearly so large as the apparent magnitude of the moon. They are round in outline, but they are composed of nothing else than myriads of stars clustered together. To give an idea of the enormous multitude of minute stars which compose one of these bodies, the following illustration suggested itself to an observer who had examined several of these objects through one of the finest telescopes in the world: take a piece of writing-paper cut into a circle about three inches in diameter, and shake a pepper-castor held over the centre of this piece of paper until the pepper is piled up in the middle so as to form a heap, gradually getting thinner at a distance from the centre, and finally ending with separate grains near the edge. Now, if we imagine each grain turned into a brilliant star, and the piece of white paper darkened into a black background, we get some idea of the marvelous way in which the stars are crowded together.

Herschel has calculated that in some of these clusters there are more than two thousand stars visible; and when it is remembered that each star is brilliant, like our sun, we see how dazzling must be the splendor amid such a host of luminaries. Astronomers know but little more of the nature of these clusters than what has been here described. The forces which are in action there by which these suns are held in the positions which they appear to maintain, are unknown. Some of these clusters are less dense than others.

But what may be the size of these constellated suns? We think ourselves the great ones of the universe, and that the heavens were hung with their starry lamps to give light to our night. Have we any reason for our pride? Certainly none, if we measure our importance by our size. When compared with that our own sun is mighty. Conceive his size. Suppose that the fiery globe were hollow, and that our earth were placed at the centre; the moon could still hold on her way, though she is distant from us two hundred and forty thousand miles; and yet there would be two hundred thousand miles beyond the moon ere the shell of the sun were reached. What a mighty mass! and yet, though so great, our sun is a speck of dust compared with the very smallest of the numberless stars which twinkle so peacefully above us. The nearest star is nearly nineteen billion miles from us; and Sir. J. Herschel calculates that if a person stood upon that star and looked towards our earth, not only would our mighty sun be utterly invisible, but if the sun were so enlarged as to fit the earth's orbit—that is, instead of being eight hundred thousand miles in diameter, he were more than one hundred and eighty millions of miles in diameter—even then that stupendous orbit would be covered by a human hair held twenty-five feet from the edge, presuming the pupil of the eye were a point!

In other words, those stars which cluster to form these mysterious balls cannot be less, and they may be infinitely greater, than luminous orbs having diameters of one hundred and eighty million of miles; orbs compared with which our earth is as an orange to the dome of our national Capitol; and yet there are thousands of such suns in one of these faintly luminous patches, scarcely visible to the eye!

ASTOUNDING DISTANCES OF THE FIXED STARS.

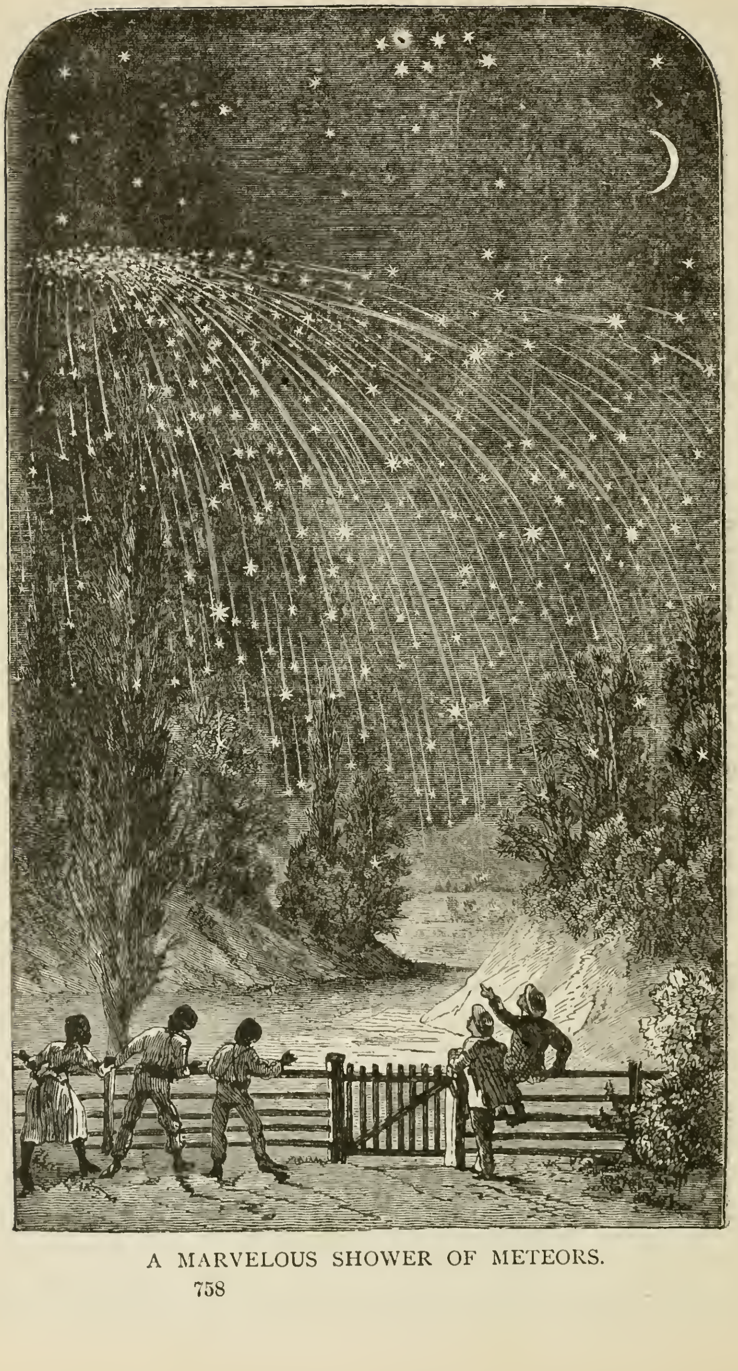
It requires a little consideration to estimate what the words nineteen billion miles really mean. A billion contains one thousand millions, and we shall endeavor to convey an idea of this amount by a simple illustration. Supposing our great forefather Adam had commenced to count as quickly as he could, and that when his life was ended his son commenced to count, taking up from the number at which Adam left off, and spent his whole life, day and night, counting as fast as he could, and supposing that at his death he enjoined on his heirs an eternity of counting, and that they had continued doing so up to the present moment, their united efforts would not yet have reached the amount of nineteen billions, the distance in miles from our globe of the nearest fixed star!

Such, then, is the distance of the nearest fixed star. We cannot grasp it in our imagination, nor are we more successful if we try to make a map. Knowing, however, the distance of the nearest star, what can we say of the distance of the farthest of those that are visible? Here precise knowledge fails us. We can, indeed, grope after the truth, and make guesses of greater or less probability. We believe that it is, at all events, hundreds of times as great as the shorter distance.

Meteors are always associated with stars, and, in fact, are shooting stars in common phraseology. On the seventh of October, 1868, one of the most remarkable fire-balls of which any record exists, was seen from three points so far distant from each other as Paris, Rouen, and London. From ten to fifteen minutes before twelve, the moon and the stars shining brightly, the atmosphere being frosty and cloudless, and scarcely a breath of air stirring, thousands of people between and around the points mentioned above, were startled by a sudden blaze of light in the heavens. The brightness resembled that of the magnesium light, and not only did the moon and stars grow dim in its lustre, but many of the eye-witnesses were so dazzled by the glare, that they could not observe the phenomenon with sufficient accuracy to give an intelligible account of it. Others, with more presence of mind, have recorded their observations. As the meteor floated slowly across the heavens (slowly when judged by the eye) in a direction from north to south, its appearance changed from that of an immense globe of white light to a comet-like form, the tail having various colors, changing from green through several shades of red to blue or purple. It exploded with a sound resembling two gunshots, audible at Paris and Rouen. The probability is that it fell at La Varenne, St. Hilaire, near the Vincennes railway, and, if so, has been identified with a meteoric stone found there and measuring about thirty-nine inches in length, by seven or eight inches in thickness.

History abounds in similar records, but it has not often been possible to combine the simultaneous observations made in distant places; and it may be doubted if the elevation would always admit of a fire-ball being observed at points so distant from each other as in this instance. In 1768, a cloud was seen to explode over the village of Lucé on the Maine, and the sound was heard ten miles distant. In 1798, a large fire-ball was seen near Benares, in India, and at several places, extending to a distance of fifteen miles. In 1803, a fiery globe of extraordinary brilliance was seen over the town of L'Aigle, in Normandy, and at such an elevation that the inhabitants of two hamlets, a league distant from each other, saw it at the same time. It burst in a shower of meteoric stones.

Fire-balls are most often seen a day or two before, or a day or two after, the recognized dates of those wonderful displays of asteroids which are now known to be a regularly recurring phenomenon at two periods of the year, one of these being in November. The probability is that all these appearances admit of one and the same explanation, namely, that they are masses of matter revolving round the sun, which come into contact with the earth, and take fire on entering its atmos-



A MARVELOUS SHOWER OF METEORS.

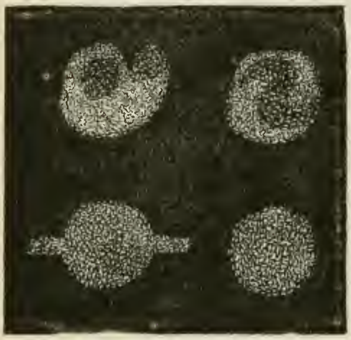
phere. The smaller particles are consumed in passing through the atmosphere, and fall to the earth unperceived, as small dust; while the larger reach the ground in great masses, and often penetrate to a considerable depth.

An observer, gifted with the keenest sight, would be utterly unable to discover, without the aid of a telescope, the slightest trace of the wonderful phenomenon known as globes of gas in the sky. He might weary himself with staring even at the exact spot in the heavens where one of these objects is situated, but not the faintest glimmer would reward his efforts. He must call in the aid of that indispensable requisite to the astronomer—the telescope—to assist him. And even a telescope of such dimensions as is usually seen would be of no use; it requires a telescope of very considerable power to show these objects at all. To show them well, tasks the utmost powers of a very first-rate instrument, such as is seldom met with. To reveal, however, the full beauty of their marvelous bodies, to exhibit them with brilliancy and clearness sufficient to show the amount of detail with which they are figured in the engravings, required the whole power of the great instrument of the Herschels, or the colossal telescope of Lord Rosse.

Let us suppose that an observer who enjoys the privilege of looking at the heavens through an instrument such as that last mentioned, directs the telescope on one of these bodies. At first, perhaps, he has a little difficulty in distinguishing it from a star, but when a higher magnifier is applied at the eye end of the telescope the difference is wonderful. He sees a very minute round ball, very bright, and glowing with light of a blue color. If he turn to another of these curious objects he will see a ball, slightly different perhaps in size, or brilliancy, or color, perhaps with very faint markings upon it, but he will find the general features in all these bodies to be the same. The observer can clearly see that this ball he is looking at is not made up of stars, and then the idea gradually bursts upon him that the object must be a globe of gas.

That this is the real nature of these objects recent discoveries have placed beyond all doubt. As we recover our astonishment at this wonder, a crowd of questions occur to us. How far off is this globe we are gazing at? All we know is, that its distance from the earth must be incalculably great. This question science cannot answer with accuracy. It is probably far more remote than most of the stars which we can see without a telescope, but even of this we cannot be quite sure. How large is it? To this also we must plead our ignorance. Knowing, however, that its distance is enormously great, we very naturally infer that it must be proportionately huge, since we are able to see it at all. But supposing we take the vast circle which the earth describes around the sun, a circle, the diameter of which is nearly two hundred millions of miles, and supposing that a globe conceived so large that it would only just pass through this circle, then we know for certain that the globe of nebulæ must far exceed this imaginary globe in bulk.

How is it that the gas is seen, and what renders it luminous? Gases, as we know them on this earth, are transparent or invisible; how is it, then, that this globe, if it be of gas, emits this lovely blue light? To this we answer that the gas is heated so hot that it becomes luminous, just as iron when heated sufficiently gives out light. Difficult, indeed, it is to form a notion of these wonderful bodies. They are utterly different from the sun, from the moon, from the planets which, relatively speaking, are quite near to us. There is no terrestrial object to which we could refer as an illustration. They are peculiar and unique bodies in the universe, and many have supposed them to be the material out of which new worlds are evolved.


CLUSTERS OF NEBULÆ.

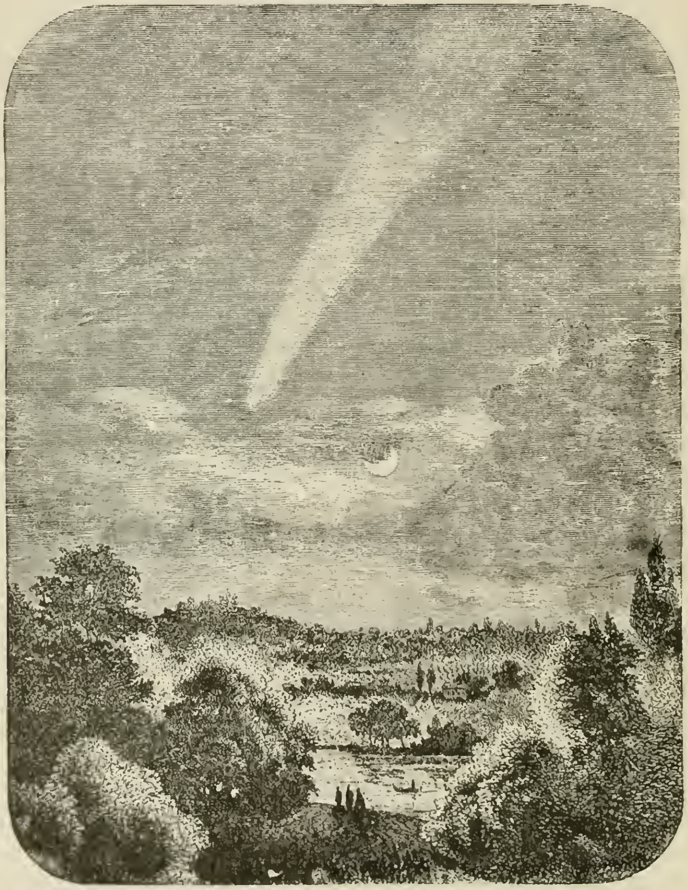
There are in the heavens about twelve of these curious objects, varying somewhat in size and also in shape and color, but the general features in all are pretty much what we have briefly described. They are denominated, along with many other curious celestial bodies, by the word nebulæ; but, to distinguish them from the great majority of the nebulæ, we call them planetary nebulæ. It must not, however, be inferred that they are connected with the planets; the only reason why this name is given is that, seen through a telescope, both the planets and the globes of gas present a sharp, round outline. Our illustration will give the reader some idea of their shape and appearance.

Among the chief marvels of astronomy must be mentioned comets. These wonderful appearances have frequently happened within historic periods, but not so often as to diminish the admiration and amazement with which each new arrival is greeted. A comet consists of a vast mass of gaseous matter surrounding a central portion which appears to be of denser material, and is called the nucleus. This vast mass of luminous gas generally assumes the form of a tail; but this is not always nor even generally the case, as a comet sometimes is nearly round, and sometimes it does not even present the nucleus, and in that case it appears like a round ball of luminous gas.

Though comets large enough to be conspicuous to the naked eye are only seen at intervals of many years, it is well known to astronomers that hardly a year passes without one or more small comets being brought within reach of our telescopes. The earth and the planets are retained in their orbits by the attraction of the sun, and it is the same great power which draws the comets within reach of our eyes and telescopes. The planets move around the sun very nearly in circles; many comets likewise revolve around the sun, but not in circles; their paths are oval or elliptical, and the sun is not at the centre of the ellipse, but near to one end of it, in a point which is known as the focus of the ellipse. These ellipses are generally very long, so that the comet takes a great period of time to travel round in its path. The one which takes the shortest journey spends three years in performing it. There are some comets that, after passing near the sun in their elliptical orbit, retreat to the other end of their ellipse, which is at such a prodigious distance that thousands of years must elapse ere they revisit the neighborhood of the sun again. One of these was a great comet which appeared in the year 1844. Its orbit was calculated, and it was found that after leaving the sun, it would retreat into space to a distance equal to four thousand times the distance of the earth from the sun, and that ere it returned again, it would have performed a stupendous journey, which would have taken it not less than a hundred thousand years to accomplish.

But there are many comets which astronomers can prove will never again return to the neighborhood of the sun. They come from the remote depths of space, at a stupendous distance from the sun and all his train of planets; on beginning to feel the effect of his attraction they move towards our system, and at length they come sufficiently near to it to be visible through a telescope, and as surely as they do so, so surely are they detected by the keen eyes of some of the numerous astronomers who are always on the watch for these bodies. They come on nearer to the sun, till their pace exceeds that of the earth itself, but they do not plunge headlong into him. Notwithstanding the vast powers of his attraction, they just whirl round the mighty luminary. Exposed to the fearful heat of his beams, the tail is developed to an enormous length. By some unknown law, which Professor Tyndall has recently sought to explain in a very ingenious manner, the tail stands out away from the sun as the comet whirls around it; then, after having passed the sun, the comet retreats again. It gradually becomes fainter, gradually is lost sight of by our telescopes, gradually plunges again into the depths of space, never again to revisit our sun, never again to be beheld by human eye. Such is the history of many of the great comets which at different times have struck terror into the inhabitants of the earth—they have retreated never more to return.

The great comet of 1843 was one of the most remarkable ever observed. The nucleus of this was so brilliant that it could be seen with the greatest ease in full daylight. This comet is remarkable for coming nearer to the sun than any other of these bodies whose paths have been determined with accuracy. It was found to approach the sun to within a distance of thirty-three thousand miles. It is easy to calculate, though not easy to imagine, what must be the heat in such a position. It would doubtless be many hundred times greater than the temperature of molten iron.



THE GREAT COMET OF 1843.

Speculations have often been indulged in as to the possibility of a collision between the earth and a comet. In June, 1861, M. Liais, the celebrated astronomer at Rio Janeiro, from observations which he had made of the great comet of that year, which had not as yet become visible in Europe, became convinced there was a great likelihood that the earth would come in contact with one of the tails of the comet; and M. Liais proved beyond question, that on the nineteenth of June, 1861, the earth really did pass through one of the comet's tails, the moment of contact being twelve minutes past six in the morning; and the earth must have been wholly immersed in the tail for about four hours. Yet it had no perceptible influence upon the weather—a very remarkable fact, adding reason to suppose that cometary matter is some millions of times rarer than our atmosphere. This phenomenon had never before occurred, according to the dictum of Arago, the astronomer. Lord Wrottesley, in 1860, remarked that when the comet of Encke returned, its motion was continually accelerated, and it was consequently drawn nearer to the sun. The final result will be, that after the lapse of ages, this comet will fall into the sun; this body, a mere hazy cloud, continually flickering, as it were, like a celestial moth round the great luminary, is at some distant period destined to be mercilessly consumed. Other astronomers differ from this opinion, and consider that there is no substantial reason to suppose the sun will ever become a great consumer of comets, although it is very difficult to explain why a comet drawn with amazing velocity toward the sun, will, upon coming near and at just the point where the attraction is the greatest, suddenly sail round the great luminary and dart away in its strange flight.

THE SUBSTANCES COMPOSING THE SUN.

Our knowledge of the physical constitution of the sun has been greatly increased within the last few years by the wonderful revelations of that most powerful engine of physical research, the spectroscope. A careful analysis of the solar spectrum formed by a prism, and a comparison of it with the spectra of terrestrial elements in a state of incandescence, reveal to us the presence in the solar atmosphere of many familiar substances, such as hydrogen, and the vapors of iron, sodium and other metals. Line for line the solar spectrum agrees with the known peculiarities of elements which form constituents of our own globe, and we have the interesting fact established that the gorgeous parent of our system is, so to speak, bone of our bone and flesh of our flesh. The same powerful analysis, when extended to the stars, discloses similar results; and we are led to the inference that our own tiny globe, though such an insignificant fraction of the universe, contains, represented within its narrow bounds, all the materials of which that gorgeous system is built up. Unfortunately the spectroscope can tell us nothing of our own satellite, though it is so much the nearest and most distinctly visible of all the orbs of heaven. Moonlight is simply reflected sunlight; and hence its spectrum is, as we should expect, but a faint reproduction of the more brilliant solar one.

The spectroscope has lately been applied successfully to those singularly beautiful phenomena which accompany a total solar eclipse, and which are generally known as the rose-colored protuberances. As soon as the sun's light is wholly cut off by the moon, cloud-like prominences of a bright roseate hue are seen projecting from its surface beyond the moon's edge; and occasionally traces of a layer of the same material are seen at their bases, which lead us to suppose that the whole sun is encompassed by a ring of this matter. Whether it is a distinct solar envelope, or only a part of the photosphere, is at present uncertain; but pending the settlement of the doubt, it has received the specific name of the chromosphere. The spectroscope shows it to consist of incandescent gas, of which hydrogen is the chief constituent; and the rose-colored protuberances are huge masses of this flaming substance, which have been hurled up into the solar atmosphere to a height, sometimes, of fifty or a hundred thousand miles above their ordinary bed.

THE GORGEOUS SOLAR HALO.

Another interesting phenomenon which appears at the time of a total eclipse is the solar corona—a great halo of light surrounding the darkened sun and stretching far out into space. This halo was at first supposed, naturally enough, to be the solar atmosphere, lighted up by the sun's rays streaming through it and imparting to it a portion of his own effulgence. But here again the spectroscope comes to our aid. It tells us the degree of pressure to which the incandescent hydrogen composing the rose-colored protuberances is subjected, and shows the impossibility of their being burdened by such an enormous atmosphere as the whole corona would represent. The progress of modern science has left little doubt as to its real nature. We have learned that the whole solar system is traversed by numberless tiny planetoids, some moving singly, others in small clusters and others in enormous groups containing countless myriads of these little units. These aërolites pursue their proper paths about the sun as truly as the largest bodies of the system, save when they get entangled in the atmosphere of our own or any of the other planets. When this is the case, the sudden checking of their enormous velocities by the resistance of the air reduces them instantly to a state of incandescence, and we see them flashing across our firmament as shooting stars, the next moment to be dissipated into vapor.

The periodical meteoric showers of August and November are caused by our orbit carrying us, at those periods of the year, right through great clusters of these aërolites. It has been estimated that not less than a hundred thousand million of them are annually caught by our atmosphere; and when we consider the comparative smallness of the ring which we traverse, we can see that the absolute number of the meteorolites belonging to our system must be something incomparably exceeding the highest flights of human calculation. In the immediate neighborhood of the sun, where his attraction exercises the most direct and potent influence, they will be found in special abundance; and it is to the fact of their existence that we must look for an explanation of the corona, and perhaps of yet greater and more interesting mysteries of our system. The corona is simply the sunlight reflected from their surfaces, as it is from the disks of the moon and planets. For a vast distance round the sun the whole firmament is powdered with them as thick as hailstones, and the reflection from them produces a continuous luminous glow, lost indeed in the overpowering brightness of ordinary sunlight, but shining out with exquisite lustre when his direct beams are cut off from us.

THE GLORY OF THE STARS.

The great distance of the stars from us prevents us from knowing almost anything whatever about their condition, except what we can infer from analogy. They hold the same place in creation that our own sun does. They are not satellites of any other body, but primary orbs, independent sources of light and heat, and probably the centres of systems not less varied and gorgeous than our own. Hence we may argue with a high degree of probability that those facts which have been ascertained concerning the general nature of the sun, hold equally true of the stars. And as for their individual peculiarities, we are for the most part equally in the dark about them also, and that for the same reason. All the stars appear to us as mere luminous specks without any perceptible magnitude. And although "one star differeth from another star in glory," though even the naked eye can detect many degrees of brilliancy among them, yet all we can infer from this is that the more brilliant ones are probably much nearer to us than the others. But there are stars which form marked exceptions to the general rule, and stand out prominently from the rest.

The existence of binary stars was discovered by Sir William Herschel toward the close of last century. It had long been noticed by astronomers as a remarkable coincidence that in several instances a pair of bright stars were found in close proximity to each other, much closer than we should have expected supposing the stars to have been scattered up and down at random over the whole face of the heavens. Still it was never thought that this was anything more than a coincidence; it was supposed that the stars had no connection with each other, but were altogether separate bodies, which merely happened to be situated in one straight line with ourselves. But Herschel having, for some scientific purposes which it would take too long to explain, determined to make a series of minute and careful observations upon these double stars, soon found to his surprise that they were rapidly shifting their positions relatively to each other; and, in short, he was erelong led to the conclusion that the two stars were in reality situated close together, and revolving in orbits round one another. Many pairs of stars of this kind were observed and registered, while in some cases the combinations were found to consist of three stars, and even four, instead of two.

IMMENSE SUNS WITH RAINBOW COLORS.

But one of the most remarkable features about these multiple stars is that they are very frequently of different colors. In the case of the double stars the two colors are usually complementary; colors, that is, which when mixed together, in proper proportions, produce white. This one will be green and the other red, or one orange and the other blue, or one violet and the other yellow. Similarly in the triple stars we may have a blue, a red and a yellow, or a green, an orange and a violet. In a quadruple star we may have blue, green, orange and red; and so on, in endless combinations. If there be any planets in attendance upon these multiple suns, as in all probability there will be, the celestial phenomena at those planets will be of the most extraordinary character indeed, and everything that depends on these phenomena—their times and their seasons, their days and their years—will be involved in the most intricate complications.

If, indeed, any of them happened to be situated in very close proximity to one of the primaries, things with it would not be so confused. It would always revolve round the same sun, though in a very irregular and perturbed orbit; and hence its days and its years would follow each other pretty much in the natural and regular order. But its seasons will vary much both in length and temperature, and its nights, though much darker than its days, will yet differ from them far less than is the case with us. For when the primary orb sinks beneath the horizon, the secondary ones will shine out in full splendor, much smaller and more distant than the primary, but yet far exceeding in brilliancy the borrowed light of the brightest of full moons. But most of their planets, not nestled close enough beside any one of their suns, will come pretty equally under the influence of all. Take, for instance, the case of a planet in a quadruple system at a time when it happens to be about equally distant from all its four suns. A green and a red sun are above the horizon, and when we look directly at either, its color is clear, brilliant and well-defined. But their rays meet and mingle and unite into a dazzling snowy white, which imparts to the whole landscape the pure radiant look which seems to fill the firmament on a sunny day when the ground is covered with snow. A light cloud-wreath steals over the green sun, and a faint rosy blush overspreads the face of the sky. The cloud thickens, and the rosy hue deepens into a mellow crimson.

Then the green sun sets and a blue one rises, changing the red light of the sky into a rich purple, veined here and there with pale amethyst, as a few rays from the green sun struggle through the clouds just as it sinks beneath the horizon. The purple changes into a deep gold as the blue sun is succeeded by an orange one, and the gold pales down as the red sun sinks to his rest in turn. The orange is left alone, and when it, too, sets, night comes on apace. And now the moons rise and shed their radiance on the scene. But how differently do they show from the pale uniform light that beams from our own plain satellite! Every color of the rainbow glows from their faces; in belts, in spots, in lunes, their checkered disks reflect every shade of hue that the artist's palette can produce.

The parts illumined by one sun alone reflect, more faintly than the rest, the colors of their respective orbs; those which come within the light of two or three of them will shine more brightly and with gayer combinations of colors; while in the parts on which all the four suns shine at once we find again the snowy white, so bright as to sparkle almost with the light of day. But where there are four great lights to rule the day, night will be of unfrequent occurrence and of short duration; and soon the four suns, their nocturnal course ended, begin at once to draw nigh to their rising. Pale, slender threads of red, green, blue, and orange steal out from the darkness in four quarters of the horizon; and these widen and lengthen till they mingle together at their extremities in softly shading hues of white, indigo, and gold. Brighter and broader they grow, and the gorgeous variegated belt spreads rapidly from horizon to zenith, till at last the suns have fairly risen, and their many-colored rays combine again into the dazzling white of the perfect day.

CHAPTER XXIV.

WONDERS OF LIGHT AND HEAT.

Light Defined—Immense Number of Vibrations—The Marvelous Prism—Polished Reflectors—The Swiftest Traveler in the Universe—Method of Ascertaining the Velocity—Hidden Heat—A Practical Application of Heat—Human Power to Bear a High Temperature—Walking Over Red-Hot Iron.

WHAT is light? The answer is wonderful enough. Light is motion—the motion or vibration of an imponderable, invisible, all-present something, which, for the want of a better word, philosophers call ether. This ether permeates all space, and is capable of receiving various kinds of motion. Sir Isaac Newton, the most profound of natural philosophers, left at the end of his great work, the Principia, three assertions—assertions which all but deserve the name of prophecies, for he seems to have had little reason for making them beyond his marvelous sagacity. Two of these have already been found true, and the third seems daily approaching demonstration. It is, that light, heat, magnetism, electricity and animal life are all the offspring of one great source; or, in other words, that these wonderful powers are all allied to each other, and are probably only the same thing in different states of motion. Every year science discovers some new connecting link. We know that electricity can produce light, heat and magnetism, and that a dead body can be made to exhibit the muscular functions of life under its influence; and that the reverse of all this is true; that electricity in its turn can be produced by heat or magnetism, or animal life. So that the day may yet come when we shall be able to show that these powers are only different states of this very ether whose motion produces light!

The eye is such a delicate organ, that we have a better means of investigating the properties of light than those of any of the kindred powers. And truly are the results of this investigation wonderful! That motion of this ether which is light, is termed "wave motion." If a stone be thrown into water, rings of waves begin to circle from the place where the water was disturbed, widening further and further. If there should be a piece of straw or any light body floating on the water, the wave does not carry this with it, but it merely rises and falls as the wave passes beneath it; teaching us that the water does not move in the direction of the wave, but each particle of fluid rises and falls again into the exact place from which it was disturbed. This is wave motion, and is the manner in which all disturbances are propagated in different media. For example: sound is produced by similar waves in the air. The air is not put into motion in such a manner as to produce wind—we do not feel a breeze, when listening to an organ, issuing from the instrument—and yet we know that sound is produced by waves of air. In an earthquake this same kind of motion is produced, and as the waves ripple the surface of the land, they upset buildings, but the earth is not cast up in waves and ridges, like huge furrows of a ploughed field, thrown in confusion over each other. A wave, in scientific language, is, therefore, understood to be an undulatory movement which passes through the medium without permanently disturbing it.

We may give some idea of the manner of this vibration which takes place in a pencil of light, by fastening a long cord to a distant point, holding the other end in the hand. When the hand is shaken, a wave runs along the string; if the hand be turned round as it is shaken, a series of waves in different positions would pass along the cord. If we imagine this cord to be ether, and, instead of one hand, many were at the same time causing the oscillations in different positions, we should have a pencil of light.

The size and rapidity ot these waves can be measured. What greater wonder can be expressed than to say that during every second the eye is looking at a violet flower or a mauve ribbon, the delicate retina is receiving and recognizing millions of the most minute and delicate impulses! Conceive the number! Suppose three million people capable of counting one hundred every minute, that this vast multitude counted on twelve hours every day; it is estimated that it would take their united effort to count for nearly ten years before they told the number of the vibrations which cause us to perceive violet color for one second.

How little do we know how wonderfully we are made! We do not say that the retina of the eye, which is the network of the optic nerve spread out to catch the light which enters through the pupil, absolutely vibrates this enormous number of times itself, but it is so delicately constructed that it can be affected by these vibrations; and the nerve receives them, and transmits them faithfully to the brain. Many persons are color-blind. That is on account of some defect either in the construction of the retina, or in the means of transmitting its impressions to the brain; the proper number of oscillations is not registered, and therefore the right color is not perceived. Just so with the ear. If the tympanum, or the fine membrane which is stretched across the tube which has its opening in the ear, be thick, it is not capable of feeling very rapid vibrations of the air, which beat against it; and as the higher the note the greater are the number of vibrations—for example, the highest note in a piano causes about three thousand vibrations in a second! Many people cannot hear so high a note, because their tympanum has become thick; and many more cannot hear the chirp of a cricket, for the same reason. The delicate construction of the eye and the ear is truly wonderful.

Every one must have observed the beautiful colored image formed by allowing a ray of light to pass through a triangular-shaped bar of glass called a prism. White light thus treated is said to be decomposed, and the ray is said to be refracted from its original course. Sir Isaac Newton was the first to notice this power of the prism, and hence came to the conclusion that ordinary light was composed of seven colored rays united in one, each being of different refrangibility. The violet, being the most diverted or refrangible, is the farthest from the red, which is the least so; the other rays occupying intermediate positions.

EXTRAORDINARY REFLECTING POWER.

Just as an India-rubber ball bounds from any surface it strikes against, so light is reflected from any object which lies in its path. Perhaps this comparison is hardly correct; for all the light does not rebound from the reflecting surface, but only a portion of the ray is reflected, the rest either being absorbed by the body, or, if the body be transparent, passing through it. The quantity of light which is thus reflected entirely depends on the state of the surface. Silver, for example, which admits of a very high polish, when excessively bright reflects almost all the rays which fall upon it; whereas, if its surface be dull, only very few are thrown back. Any surface which is not highly polished is really made up of innumerable small projections, which the process of polishing either lays flat or shaves off; and when a beam of light strikes such a surface, each of these projections throws back some of it, and scatters the light in a thousand ways—or, as science expresses it, the light is dispersed. This is the reason why you cannot see your face in a sheet of paper; the light which shines from your face reaches the paper, but instead of being thrown back regularly, as it is by a polished surface, it is scattered in every direction.

If the surface be perfectly smooth, the light which comes from any object is reflected from the surface unbroken, just as it comes from the object, and, therefore, carries an image of the object to the eye. This is the case with a looking-glass; and it will be noticed that the image is apparently just as far behind the glass as the object is really before it. This fact has been ingeniously taken advantage of to exhibit that popular wonder, the sphynx. The exhibitor prepares a three-legged table, and fits two sheets of looking-glass from one leg to the other two legs—that side of the table which has no looking-glass between its legs is away from the audience. The floor of the stage is covered with green baize, and the sides and back are hung with plain red material. The audience see the reflection of the sides from the looking-glasses, and fancy they are looking under the table to the back of the stage. Of course, the owner of the head is kneeling under the table. The conjurer carefully abstains from going behind the table, or another wonder, not included in his startling programme, would be produced—that of a legless wizard.

ASTONISHING VELOCITY OF LIGHT.

Beams of light shoot through the fields of space with the prodigious velocity of one hundred and ninety-six thousand miles a second; so that a wave of light issuing from the fires of the sun speeds on its journey for eight minutes before it reaches our world. If a trip to the sun were advertised by the "runners" of the day, and a train equipped for the journey—supposing it never stopped at any of the planetary stations, but rushed on forty miles every hour—it would require generations to reach the sun; and yet this space, which one of our express trains could only travel in two hundred and seventy years, is passed through by a beam of light in eight minutes! How can such rapid motion be measured? The finding of the velocity of light is no less wonderful than the velocity itself.

In the year 1676 the Danish astronomer, Olaus Roemer, observed certain eclipses of the moons of Jupiter. Now we know all about the four moons which circle round the bright and lovely planet which so often is a conspicuous object in our heavens, and therefore we know when they pass behind the planet and so become eclipsed. The exact time of these eclipses is calculated, and is one means by which sailors can find out where they are on the ocean. The very best chronometers vary, and therefore tables are published, in which the times of the eclipses of the moons of Jupiter are given. Suppose that to-night one of the moons passes behind the planet at ten o'clock precisely, the captain of a vessel is not sure that his chronometer is right, so to him Jupiter and his moons become a watch; he turns his telescope upwards, observes the instant the little bright spot is lost behind the disc of the planet, and then he knows it is just ten o'clock. This was the very thing Olaus Roemer was about, but he could not understand how it was that when he made his observations when Jupiter was nearest the earth the eclipse always happened too soon, and if the planet happened to be on the other side of the sun—the furthest possible distance from the earth—it took place nearly sixteen minutes too late.

There was only one way of accounting for this—namely, that the light took sixteen minutes in traveling across the earth's orbit of one hundred and eighty-six million miles, to accomplish which its velocity must be one hundred and ninety-two thousand five hundred miles a second. But still more wonderful is it that this prodigious swiftness can be measured with the greatest accuracy by actual experiment; the ingenuity of Fizeau invented the plan by which it can be done. He arranged two telescopes at a distance of nine thousand four hundred and forty yards, looking at each other. In the further end of the distant telescope was a looking-glass, and a cog-wheel was so arranged before the near telescope, that if you looked through it you saw the further telescope through the space between two of the teeth of the wheel. If the wheel was moved round a very little, one of the teeth would come before the end of the telescope and shut out the view of the distant object.

When all this was thus adjusted a lamp was placed on the same side of the toothed wheel as the telescope, and a ray of light caused to pass through one of the spaces; of course this light shot away to the other telescope, and was reflected back from the looking-glass in it to the first telescope, passing through the space between the teeth, and so through the instrument to the eye. But suppose that, while the light from the lamp was on its way, before it could touch the reflector more than five miles off, and come back again to the place whence it started, and enter the telescope, as we have said, the wheel had moved, and, when the beam returned to the end of the telescope, instead of finding an opening, it was obstructed by a tooth, and prevented from entering, so that the person looking through the telescope would not see the light. Then to measure the velocity all that is necessary is to look at the reflection of the light in the distant mirror, then set the wheel in motion, being careful to know how many turns it makes in a second, and increase the motion until the light can be no longer seen. Fizeau found that when his wheel, which had seven hundred and twenty teeth, revolved at the rate of a little more than twelve revolutions in a second, the light was eclipsed; from this it was very easy to calculate what time the light spent in passing through nearly eleven miles—to the further telescope and back—and so we learn the fact that light travels at the rate of one hundred and ninety-six thousand miles a second; and yet some of those stars which glimmer in the firmament above us are so far away that hundreds of years ago they may have been blown into a thousand fragments, and the light of the explosion, has not reached us yet, to tell of the star's destruction.

Sound travels much slower than light. It passes through the air at the rate of one thousand one hundred and thirty feet a second. This is the reason why we always see the flash of a gun before we hear the report, and in a thunderstorm, if we count the seconds which elapse between the glare of the lightning and the first roll of the thunder, we know that for every five seconds we count the scene of the electric discharge is a mile distant. The waves of sound do not maintain the same velocity in all media; in water they travel at the rate of four thousand nine hundred feet a second. This fact was proved at the lake of Geneva, by striking a bell under water at a given signal, and a distant listener, by means of an ear-trumpet, whose mouth was beneath the surface of the water, registered the moment the sound reached him. In some media the velocity is much greater.

LATENT HEAT.

It is a wonder which must have struck the observant reader, that the water in a kettle never becomes hotter than that temperature at which it boils. If we place on the fire a kettle of cold water, we know that heat passes from the fire into the water, and it gradually becomes warmer and warmer until at last it tosses and bubbles, and we say it boils. If we had placed a thermometer in the liquid, we should have found that this temperature was 212° Fahrenheit; but when once the thermometer gains this height there it stays, although the heat is still passing from the fire into the water. What becomes of this heat? Where is it? Where has it gone to? It evidently has had no effect upon the thermometer, and therefore, since it exists somewhere, it is called latent heat, or heat which has hid itself. The truth has been discovered; it is this: that all bodies seem capable of existing in three states—solid, liquid, gaseous—and the power which causes them to change their state is heat. Before the water could become steam—that is, before it could exist in the gaseous state—it required a large quantity of heat; and this heat was so occupied with its own particular work that none of it came out to affect the thermometer, and therefore it does not in the ordinary way make known its presence.

The quantity of heat which thus is latent in steam is enormous. Of course we cannot measure heat by yards or pints; but the unit of heat, or the measure of heat, has been agreed upon to be that quantity which can raise a pound of water one degree. Now to turn a pound of water into a pound of steam, it requires nine hundred and sixty-seven of these units of heat; that is to say, if we boil a pound of water until it all goes away into steam, we shall have used, in doing so, a quantity of heat which would have raised nine hundred and sixty-seven pounds of water one degree higher in temperature.

Of course, when steam condenses, it gives off all this heat again. This fact is of the utmost importance in the economy of nature. Water gives off steam at all temperatures; ice and snow even evaporate, and thus give off steam. In this way there is a constant absorption of heat. If it were not for this, the heat of the sun would make the waters of tropical countries so warm that it would be fatal to the animals which live in them, and the inhabitants would have no means of cooling themselves in the intolerable heat. When the rays of the sun fall upon a surface of water, they cause rapid evaporation, and the steam thus produced absorbs the heat, which would otherwise have entered into the water. Then again, when that vapor condenses, it gives off its latent heat; so that the cold blades of grass at night receive warmth when the dew settles upon them, and this tends greatly to their rapid growth—so wonderfully is the temperature balanced.

MYSTERIES EXPLAINED

The knowledge of the above facts enables us to explain many homely truths. Why is it that our hand feels cold when we blow upon it?—blow upon it, too, with warm breath! The reason is this: the skin is that organ which equalizes the temperature of the body. This it does by allowing more or less perspiration to come to the surface and be evaporated, as the occasion requires. For example, when we run we cause greater activity in all the functions of the body. The blood passes through the heart more quickly; the action of the lungs is correspondingly increased; we breathe more rapidly; but this causes a greater generation of heat; the skin becomes aware that the body is getting too hot, so it opens its pores, and allows an extra quantity of perspiration to come to the surface. This evaporates, but requires for the change of state a large quantity of heat, which it takes from the body, and so the temperature is kept down. Wonderful provision! The steam when formed floats in the air; but the air can only contain a certain quantity, and when it has its complement it is said to be saturated, and can take up no more; so that when such an atmosphere rests on a moist surface, no evaporation can go on at all. The hand is always enveloped with a layer of air very full of moisture, and consequently little evaporation goes on; but when we blow upon the hand, we drive away this moist air, and it is replaced by dry air, and the evaporation proceeds rapidly, taking its necessary heat from the hand, thus causing the sensation of cold.

Some liquids, such as ether, alcohol and bisulphate of carbon, evaporate more rapidly than water; and by causing ether to evaporate very quickly in a chamber of metal from which the air is exhausted, great cold is produced; for evaporation goes on very rapidly in a vacuum, as might have been expected.

WONDERFUL APPLICATION OF HEAT.

Experiment, remarks Baron Liebig, has shown that a quantity of heat, suffiicient to raise a pound of water one degree of temperature, will, when communicated to a bar of iron, enable it to elevate a weight of thirteen hundred and fifty pounds to the height of one foot. An interesting application of this fact was long ago made in the Conservatoire des Arts et Métiers, in Paris. In this building, which was formerly a convent, the nave of the church was converted into a museum for industrial products, machines and implements. In its arch, traversing its length, appeared a crack, which gradually increased to the width of several inches, and permitted the passage of rain or snow. The opening could easily have been closed by stone and lime, but the yielding of the side walls would not have been prevented by these means. The whole building was on the point of being pulled down, when a natural philosopher proposed the following plan, by which the object was accomplished: a number of strong iron rods were firmly fixed at one end to a side wall of the nave, and after passing through the opposite wall, were provided on the outside with large nuts, which were screwed up tightly to the wall. By applying burning straw to the rods they expanded in length. The nuts by this extension being now removed several inches from the wall, were again screwed tight to it. The rods on cooling contracted with enormous force, and made the side walls approach each other. By repeating the operation the crack entirely disappeared. This building, with its retaining rods, is still in existence.

POWER OF BEARING EXTREME HEAT.

The writer remembers a terrible story published many years ago, of a fire at a brewery. The narrator, trying to escape, had no alternative but to jump into a copper vat, at the bottom of which was a little heap of brick and mortar rubbish, on which he stood. The vat became red-hot around him, and yet he was rescued without having sustained any material injury beyond the fright. Many facts similar to this are recorded by Sir David Brewster in his "Letters on Natural Magic." The best known of these incidents are the experiments made by M. Tillet, in France, and Dr. Fordyce and Sir Charles Blagden, in England. These gentlemen went into a room, the heat of which exceeded 260°, and though Sir Charles Blagden's pulse rose to one hundred and forty-four beats, or double its ordinary quickness, no harm ensued. In order to prove that there was no mistake as to the degree of heat endured, several steaks were cooked and eggs roasted in the same place. At Rochefoucault, in France, the girls who are accustomed to attend to the ovens of a bakehouse are capable of enduring for ten minutes a temperature of 270°. It will, of course, be remembered by our readers that water boils at 212°.

Sir F. Chantrey, the celebrated sculptor, proved in his own person that the human body is capable of bearing very much higher temperature than any we have mentioned. The furnace in which he dried his moulds was about fourteen feet long, twelve feet high and twelve feet broad. When raised to its highest temperature, with the door closed, the thermometer marked 350° of heat, and the iron floor became red-hot. Nevertheless, Chantrey's workmen often entered it at a temperature of 340°, walking over the red-hot iron floor with wooden clogs, which became charred on the surface. On one occasion, as Sir David Brewster relates, Chantrey himself, accompanied by five or six of his friends, entered the furnace, and after remaining two minutes, they brought out a thermometer which marked 320°. Some of the party experienced sharp pains on the tips of their ears, and in the septum of the nose, while others felt a pain in their eyes.

To transform a solid into a liquid there is a disappearance of heat. In melting a pound of ice, one hundred and forty-two units of heat are consumed, and the resulting water is of the same temperature as the ice before it melted ; and what may seem more wonderful is, that if a piece of ice be placed in a vessel on the fire, a thermometer will indicate the temperature of 32° Fahrenheit—the freezing point—so long as there is a particle of ice not melted ; and only when the last piece has disappeared will the water begin to warm. Water gives off steam at all temperatures ; ice and snow even evaporate, and thus give off steam. In this way there is a constant absorption of heat. If it were not for this, the heat of the sun would make the waters of tropical countries so warm that it would be fatal to the animals which live in them, and the inhabitants would have no means of cooling themselves in the intolerable heat. When the rays of the sun fall upon a surface of water, they cause rapid evaporation, and the steam thus produced absorbs the heat, which would otherwise have entered into the water.

CHAPTER XXV.

MISCELLANEOUS WONDERS.

Earthquakes—The Great Brooklyn Suspension Bridge—The Mont Cenis Tunnel—Tunnel Under the Hudson River—Ruins in Bolivia—Diversity of Human Faces—Forms of Sound—Sounding Stones and Speaking Heads—Power of Sound—Famous Bells—A Cherished Relic—Dancing Snakes—Adventures of a Diamond—Greek Fire—Vegetable Curiosities—The Mute Alphabet.

NO earthquake has visited the territory of the United States within the historical period which can be compared in extent or energy to the convulsion in August, 1886, that was felt from the Mississippi to the Atlantic, and which wrought such terrible disaster in Charleston, yet shocks similar in character but less in degree are of constant occurrence. Observations show that on the Atlantic slope there is on the average one disturbance of this kind every month. These, however, as compared with the calamities which have desolated other parts of the world, are very small and insignificant.

In Asia, Africa, Europe and South America these upheavals have levelled whole cities and numbered their victims by tens, and in some instances hundreds, of thousands. In Judea, at the time of the battle of Actium, 31 B.C., an earthquake killed ten thousand people. Antioch has been visited by several of still greater magnitude, one of which, 526 A.D., is said by Gibbon to have slain two hundred and fifty thousand persons; and the same city was visited about sixty years later by another that made thirty thousand corpses. The earthquake, with volcanic eruption of Vesuvius, that wiped out Herculaneum and Pompeii in the year 63, need only to be mentioned. In more modern times earthquakes have slain one hundred thousand at Calabria, Sicily, in 1783; and twelve thousand in the Argentine Republic in 1861. These are only a few of the great calamities of this kind that history records.

In the great earthquake of Calabria some extraordinary changes of position were effected. Houses were removed and carried up to places higher than those they had originally occupied. In some places large pieces of ground exchanged their respective situations, and for several years after the earthquake, lawsuits used to be brought in the courts of Naples, to decide the claims to which this singular confusion had given rise.

One of the most terrible earthquakes on record is that which happened at Lisbon on the first of November, 1755. The morning was fine, and there was no apparent indication of the coming destruction. About nine o'clock, a low, subterraneous rumbling was heard, which gradually increased, and culminated, at last, in a violent shock of earthquake, which levelled to the ground many of the principal buildings of the place. Three other shocks followed in rapid succession, and continued the work of destruction. Scarcely had the ill-fated inhabitants begun to realize the enormity of the disaster which had come upon them, when they were surprised by another visitation, of a different but not less destructive character. The sea suddenly began to rush with great violence into the Tagus, which rose at once as much as forty feet above high water mark. The water swept over a great part of the city, and many of the inhabitants fled from its approach to take refuge on a strong marble quay lately erected. They had collected there to the number of three thousand, when the quay was suddenly hurled bottom upwards, and every soul on it perished. There was another shock in the evening which split the walls of several houses; but when it passed away, the rents closed up again so firmly that no trace of them could be seen. What the earthquake and the flood had spared was consumed by fire. The first of November, being all Saint's Day, was kept as a high festival, and all the churches were brilliantly illuminated with candles; these falling, with the shock of the earthquake, against the timbers and curtains, set fire to them, and as there were no means of checking it, the conflagration rapidly spread. It is stated that by the combined effects of these disasters, no less than sixty thousand persons perished. The destructive effects of the earthquake were felt, more or less, throughout the whole of Portugal and a great portion of Spain.

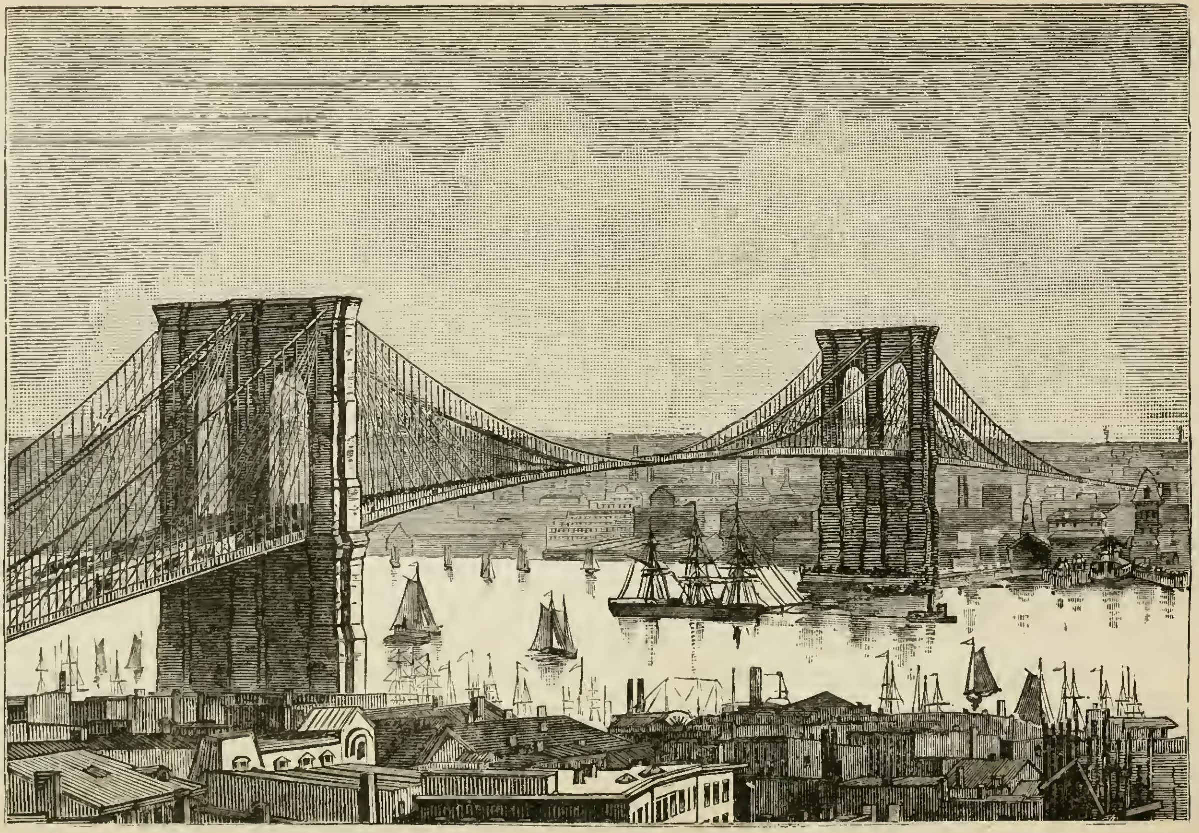
One of the most destructive earthquakes of modern times was that which, in the Island of Java in 1884, destroyed thirty thousand lives, and engulfed a range of mountains forty miles in length, leaving no trace of the line along which it extended. Immense clouds of dust extended even to the opposite hemisphere.

The primary and immediate causes of these convulsions of nature we may not be able to determine with scientific accuracy. There are no data upon which to base theories as to when or where they may take place, or the effects they will produce. It is very much a matter of conjecture, or, at best, of probability, from a process of inductive reasoning. This is something like the explanation of earthquakes which geologists have usually accepted: the earth is believed to be enclosed by a solid crust of rock of variable thickness in different regions. This crust rests upon material in a more or less fluid condition, so that it readily yields to agencies of deformation, like water or molten iron. The interior of the earth is constantly losing heat in a variety of ways. A small amount is probably conducted to the surface and radiated into space. A large amount of heat is conveyed from the interior through the agency of hot springs. Such springs are found in many portions of the known earth, and in a few districts are very abundant, and through them much heat is conveyed from the interior to the surface, which is there radiated into space. The lavas that are brought up yield vast stores of heat, all of which is lost to the earth through radiation. The constant cooling which results from the above causes must necessarily diminish the magnitude of the earth, and as it shrinks, the solid exterior crust must in some manner yield so as to conform to the lesser magnitude thus produced. The stresses produced in the crust of the earth by the shrinking of the interior are modified by another class of agencies.

The land surface of the earth is washed by rains and rivers, and, in the aggregate, large bodies of material are carried away and deposited in lake bottoms, which are gradually filled up, and especially deposited along the shores of the seas. The unloading of land areas and the overloading of certain water areas to a large extent localizes it. Again, the fluid or plastic material of the interior changes its position beneath the crust of the earth, and portions of it flow out as lavas. Thus stresses are established through the agency of a contracting interior, through loading and unloading at the surface, and through the flow of interior matter to lava-beds, where such matter is poured out upon the surface. The stresses produced by the various agencies thus described, gradually become so great that at last the crust of the earth must yield, and earthquakes result. All this, however, is only hypothesis, of which no positive proof can be given; and when science has said and done its best there is still, beyond all that, to be recognized the operation of a divine, mysterious, supernatural power.

DIMENSIONS OF THE BROOKLYN BRIDGE.

This bridge may truthfully be claimed as one of the finest achievements of engineering in modern times. It is one of the famous sights of New York, and no one can fail to be impressed with its immense proportions, great solidity and strength, as well as the herculean task of constructing it. The work commenced January 3, 1870, and the bridge was opened to the public, May 24, 1883. The total cost was fifteen million five hundred thousand dollars. The total length from New York to Brooklyn is fifty-nine hundred and eighty-nine feet, and the length of the main span is fifteen hundred and ninety-five and a half feet. The height of the towers is two hundred and seventy-six



THE GREAT SUSPENSION BRIDGE, CONNECTING NEW YORK AND BROOKLYN.

and two-thirds feet. The height of the floor of the bridge at the centre, above high water mark, is one hundred and thirty-five feet, and the height at the piers is one hundred and eighteen feet. The caisson for the New York pier was sunk seventy-eight feet, and that for the Brooklyn pier forty-five and a half feet below the bed of the river. Each cable is fifteen and three-quarters inches in diameter, and is made up of five thousand wires, each one-eighth of an inch in diameter. The anchorages are nine hundred and thirty feet from the towers, and are capable of sustaining an immense weight. The cables are capable of sustaining forty-nine thousand two hundred tons. The weight of the central span is sixty-seven hundred and forty tons, and the maximum weight of passengers, cars and vehicles which can be crowded on the central span is about thirteen hundred and eighty tons.

THE WONDERFUL MONT CENIS TUNNEL.

But of all the projects with which engineers of the present day surprise us, the most wonderful as yet is undoubtedly the tunnel through the heart of Mont Cenis, the Alpine barrier between France and Italy. Everyone knows the story of the passage of the Alps by Hannibal in the old Roman times, and again by Napoleon in our own, both which events are regarded as marvels of daring and persistent endurance. In more recent times the passage over Mont Cenis has become the regular highway from France into Italy whenever, from the state of the weather, it was practicable. But the traveling was often interrupted by snow, and at most periods of the year was full of discomfort, if not of danger. Modern engineering proposed to put an end to all this, by going through the mountain instead of over it. To pierce through the very heart of Mont Cenis, a distance of more than seven and a half English miles, under circumstances which might well have been supposed to present insuperable engineering difficulties, is an achievement before which those of Hannibal and Napoleon sink into insignificance.

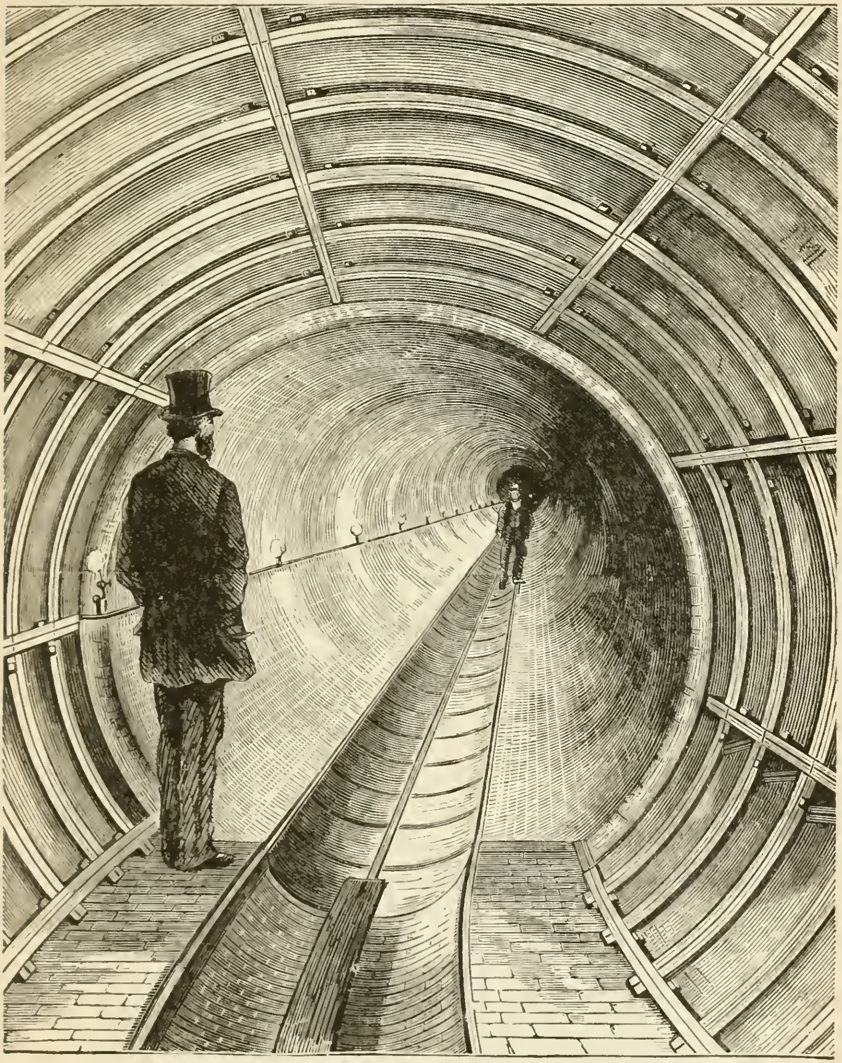
First, the perforating machinery had to be invented, and it was required to be powerful enough to make its way through rocks harder to work than even granite. The mountain mass consists, for the most part, of what geologists call a "crystallized calcareous schist," interrupted occasionally by large masses of pure quartz. A thousand years might have been spent in vain attempts to bore and blast this rock with the ordinary means. But the difficulty of the work only seemed to stimulate the ingenuity of the engineers, who vied with each other in producing the most elaborate machines for this purpose. It was resolved to commence the tunnel from both sides of the Alps at once, and this rendered it necessary to contrive means for laying out the line accurately, so that the two bores might meet. Plans and levels to determine the sections, and to fix the axis of the tunnel from various points on the mountain, had to be taken under enormous difficulties of all kinds. At length this was done so satisfactorily that, on making a final summary of the results, the deviation was found to be less than a foot for the whole distance.

We say nothing here of the extraordinary labor and various strange contrivances involved in the preparatory works, and how the difficulty of supplying air to the workmen was overcome; these are points which will be easily imagined by the reader. The work of tunnelling was not actually commenced till November, 1860, three years after the project had been sanctioned by the Sardinian government. The time allowed for the completion of the tunnel was twenty-five years, and it was finished within that time. The tunnel is not driven at one uniform level. The entrance on the French side, near the village of Fourneau, is thirty-nine hundred and forty-six feet above the sea; on the Italian side, at Bardoneche, it is forty-three hundred and eighty feet above the sea-line. This difference of level, four hundred and thirty-four feet, causes a gradient, or gradual ascent from the French side, for a distance of four miles. Trains passing from France to Italy take from thirty-eight to forty minutes running through, while those from Italy into France accomplish the distance in about thirty minutes. The difference in level of the two ends of the line accomplishes, by natural means, the perfect ventilation of the tunnel, which otherwise would have been a work of perpetual expense, if not of considerable engineering difficulty. The expense was borne in equal proportions by Italy and France.

AN UNDERGROUND RAILWAY.

One of the great enterprises which is taxing the skill of engineers, and calls for an immense outlay of capital, is the tunnel under the Hudson River to connect Jersey City with New York. The tunnel under the river Thames, in London, has proved the practicability of making excavations beneath a water-bed, and by cemented arches protecting them from being flooded. The vastness of the excavation under the Hudson will readily be understood when we state that it will need to be something like three miles in length, beginning some distance from the river on each side. The width of the tunnel will need to be great in order to render it serviceable for the passage of railway trains. The advantages of being able to land the loads of freight and passengers in New York, which come constantly pouring in from the West, without any transfer to ferry-boats, are so evident that we may look for a speedy completion of the undertaking, which will certainly come true if money and mechanical genius are capable of such an achievement.

This island of Titicaca appears to have been regarded much in the same way as Mecca and Medina were by the Mohommedans, and as Jerusalem was by the Jews. Pilgrimages were made to it by the old Incas. On the road to the temple were a number of huge rocks, which could be imagined to represent almost anything; just in the same way as we can sometimes see warriors and flocks of sheep in the red cinders, as we sit dreamily looking into the fire. The Incas said



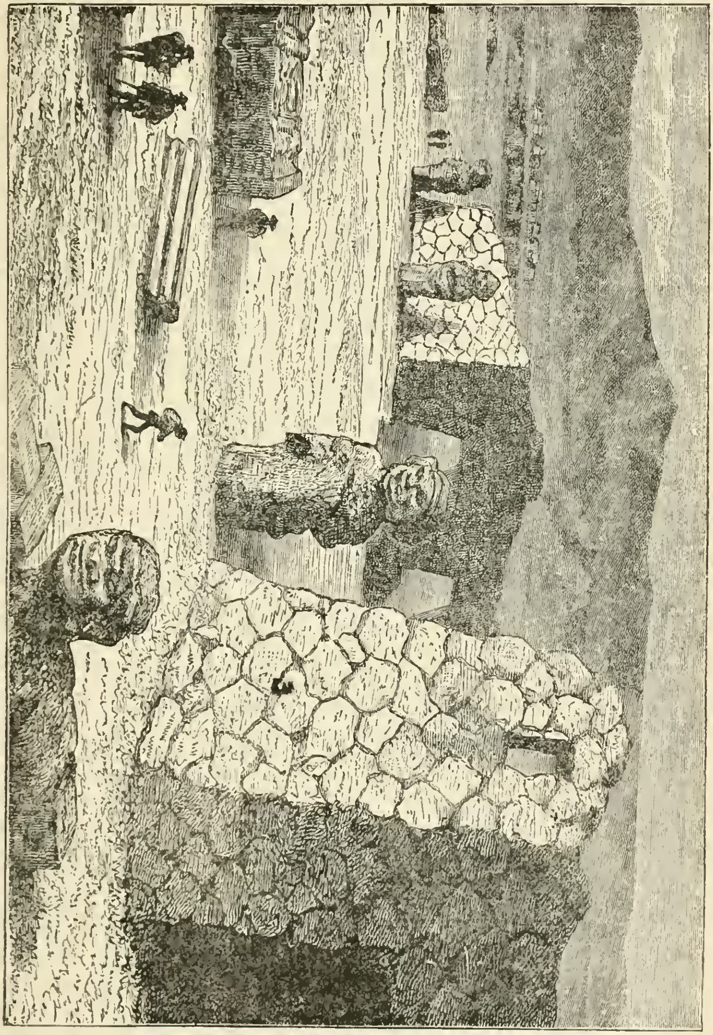
PROPOSED TUNNEL UNDER THE HUDSON RIVER.

these rocks were men who, as a punishment for not having fasted sufficiently, or made every necessary preparation for the pilgrimage, had been turned into stone, and were doomed therefore to stand in future as warnings for others not to neglect their duty. Travelers who have visited them tell us that they must have been built long before any other monuments in America—before even the time of the first Incas; and that, although so long ago, the people who erected them must have been very clever and industrious.

When the Spaniards went sweeping into that part of the country to take possession of it, they gazed in astonishment at these marvelous structures, and asked the Indians what they were, and who built them. They existed, said the poor red men, before the sun shone in the heavens, and were raised by giants; or perhaps they are the remains of some wicked people whom an angry god converted into stone for their wickedness. From what the Indians said it was very evident they were as ignorant of the origin of the ruins, near which they had lived all their lives, as were the foreign soldiers. With all their skill these old builders, whoever they may have been, did not understand the use of mortar, or rather they could build so well without it that they did not need to know its use. Like Solomon's Temple, the stones were made to fit exactly into each other, and were held in position by round holes drilled into the top and bottom of each stone at corresponding distances, into which were placed pins of bronze.

There seems to have been a fortress, and a palace, and a hall of justice; all of which prove that the place was the house of a set of people who were civilized and refined, but who, long before the time of Columbus or any other modern adventurer, had died, and left no sign to tell us truly who they were. For all that, no one can gaze upon these old ruins and heads carved in stone without being filled with admiration for the unknown architects who passed away so long ago.

In many parts of Bolivia, and also in Peru, are to be seen also by travelers some remarkable buildings which are known by the name of chulpas. They vary in height; some are twenty, others thirty feet high. Some are in ruins, some half-finished, and others as perfect as when first built. They were probably erected by the old Incas, or even by a race of people older still, to serve as tombs for dead friends; because in many of them skeletons have been found, as well as gold and silver ornaments, and other things. They all differ from each other in some way; no two are alike. The large handsome ones are supposed to have been built for eminent and distinguished persons, the small ones for individuals of less importance; but in one respect they are all alike, and that is that the doors all face the east. The Incas, as we have heard, worshiped the sun, and most likely the doors have been thus placed out of respect to their deity. Although the present inhabitants can give us no certain information respecting these chulpas, an Indian guide once declared that according to tradition the builders, whoever they were, at the approach of death, caused themselves to be walled up without food, believing that by so doing a happy life in a future state would be ensured to them. Whether this statement be true or not is uncertain, but that the chulpas are among the most remarkable monuments of America is undeniable.


WONDERFUL RUINS OF TITICACA—IMMENSE HEADS IN STONE.

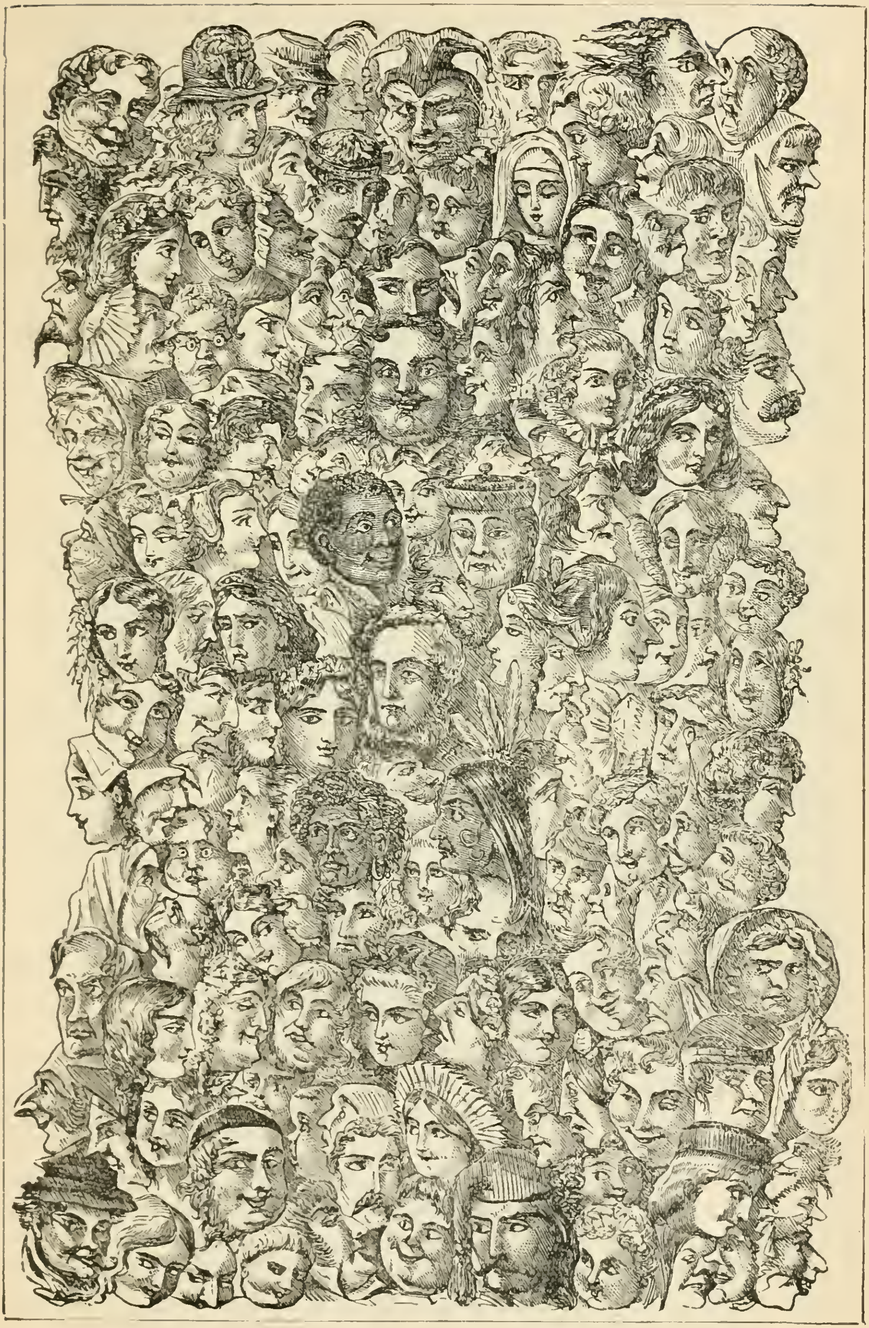
One of the most surprising facts in nature is the infinite variety of human faces. It seems incredible that of the fourteen hundred million people in the world no two faces should be exactly alike, no resemblance so close as to prevent the possibility of easily distinguishing one person from all others. Either by the color of the skin, the shade of the complexion, the shape of the features or the expression of countenance, there is something to mark every individual from all others.

Let a hundred faces be placed side by side—faces taken promiscuously from the different races, ages and professions or employments—and the diversity will be so great as to surprise every observer. In one instance the forehead will be high, in another it will be low; one will have an aquiline nose, another a "pug" nose; one mouth will have thin lips, another lips that are thick; one eye will be a mild blue, another will be dark and fiery; one chin will be elongated, another will be short and round; the contour of one face will be oval, that of another will be circular; the complexion of one will be fair, that of another will be swarthy; and so there will be some peculiarity in every face to characterize it, and each person will be marked and separated from every other, having his own distinctive features.

The human face in its various phases also expresses every variety of emotion. Joy and sorrow, hope and despair, pleasure and disgust, eager curiosity and stolid indifference, are all represented. The man who is mercenary, the man who is open-hearted and generous, the one who is genial and sympathetic, as well as the one who is cold and reserved, the individual who is vain and self-conscious, and the one who is plain and unpretentious, can be distinguished by peculiarities of face and features. This vast diversity is one of the wonders of which the human race presents so many.

CURIOUS FORMS OF SOUND.

It is a well known fact in natural philosophy that there are various forms which the vibrations of sound can be made to produce. These phenomena are illustrated in the following manner: a plate of glass or metal must be held between the finger and thumb at one corner, having been previously strewn over with some fine sand; then, if a fiddle-bow be drawn near one of its angles, the sand becomes agitated, and finally resolves itself into the form of a Latin cross, as in Fig. 1. If the bow be drawn near the middle of one of the sides, a St. Andrew's cross will be formed. If the plate is pinched on the edge, the sand will immediately commence to form itself according to the shape shown in Fig. 2; but if the plate be pinched a little nearer to the centre, the lines will become curves, as in Fig. 3.



WONDERFUL VARIETIES OF RACE AND PHYSIOGNOMY.

In Sir David Brewster's letters on Natural Magic, addressed to Sir Walter Scott, the figures we have alluded to are elaborately described, as are also the forms that sand will assume when sprinkled upon a membrane that is agitated by sound, these forms varying with atmospheric influences. After describing the effects produced on a square plate, he says: if the plate of glass is circular and pinched at its centre, and also at a point of its circumference, and if the bow be applied at a point 45 degrees from the last point, the figure of the sand will be as in Fig. 4. If with the same plate, similarly pinched, the bow is drawn over a part 30 degrees from the pinched point of the circumference, the sand will form six radii. When the centre of the plate is left free, a different set of figures is produced from those obtained before. When the plate is pinched near the edge, and the bow applied 45 degrees from the point pinched, a circle of sand will pass through that point, and two diameters of sand, at right angles to each other, will be formed, as in Fig. 5. When a point of the circumference is pressed against a fixed obstacle, and the bow applied 30 degrees from that point, Fig. 6 will be produced.

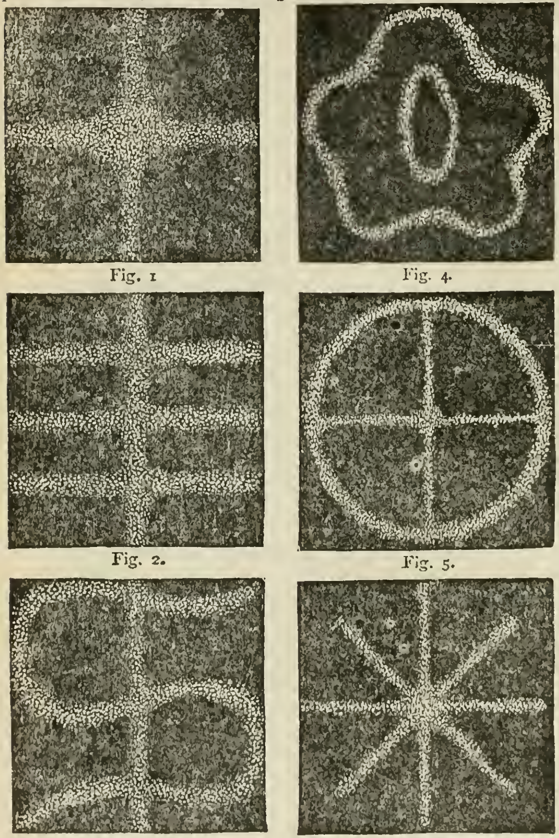


Fig. 1 Fig. 4.
Fig. 2. Fig. 5.
Fig. 3. Fig. 6.
MARVELOUS SOUND FORMS.

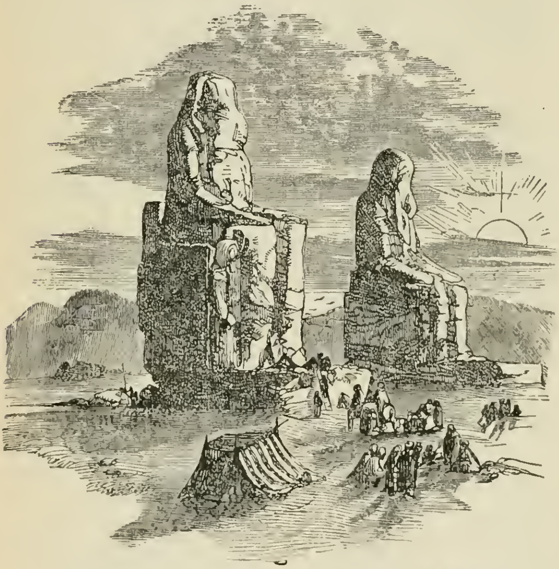
These forms, induced by sound, may be also seen upon a disc, which is agitated slowly by the vibrations of air communicated from a plate in the manner before described. If a goblet glass, or any large glass with a stand, be taken, and some damp paper stretched across the mouth, the edges having been previously gummed to cause the paper to adhere, and some sand strewn on the surface when dry, the experiment made with a plate in any of the preceding forms will, if the plate is held horizontally over the tumbler, be repeated on the paper disc, any variation from the horizontal position in which the plate is held producing a variety of distinct mathematical forms in the disposition of the sand, which may be also varied if it be breathed upon, the sand, influenced by the temporary moisture, assuming a number of forms, until the perfect evaporation is complete, when the original shape is reproduced. An organ, or pitch-pipe, or a flute blown at the distance of a few feet, will produce a variety of figures in the sand, upon the stretched disc of paper; in the practice of which experiment our readers may make themselves acquainted with the varied shapes of the forms of sound.

SOUNDING STONES AND SPEAKING HEADS.

The ancient magicians appear to have been very successful in turning to their purposes the properties of sound. In the labyrinth of Egypt, which contained twelve palaces and fifteen hundred subterranean apartments, the gods were made to speak in a voice of thunder; and Pliny, who lived at this time, informs us that some of the palaces were so constructed that their doors could not be opened without the peals of thunder being heard in the interior. Darius Hystaspes used to impress the divinity of his character upon his subjects by the bursts of thunder and flashes of lightning which accompanied their devotions; and it is thought that in the subterraneous and vaulted apartments of the Egyptian labyrinth, the reverberated sounds arising from the mere opening and shutting of the doors themselves afforded a sufficient imitation of ordinary thunder to impose upon the credulous worshipers. Sir David Brewster conjectures that the method used in our modern theatres was known to the ancients. This is to shake a piece of sheet iron horizontally, so as to agitate the corner in a direction at right angles to the surface of the sheet, by which the deep growl of distant thunder, as well as the loud and explosive bursts which rattle over our heads, may be produced. The same effect may be produced by sheets of tin-plate and thin plates of mica, but the sound is shorter and more acute. Imitative lightning is produced by throwing powdered rosin, or the seeds of lycopodium, through a flame; and rattling rain is imitated by a shower of peas in a sort of drum.

The ancients turned to account the accoustic properties of certain kinds of stones in a remarkable way. Pausanias tells of a marvelous stone that was placed as a sentinel at the entrance of a treasury, and that robbers were scared away by the trumpet tones which it sent forth. Several stones have this property of resonance, and it is probable that a stone of this description was so suspended as to be struck by a projecting piece of metal when the external door of the treasury was opened. Strong boxes or safes have been known to emit sounds to alarm their owners when broken into surreptitiously. M. Salverte relates that Louis XV. possessed one of these, and that Napoleon I. was offered one at Vienna in 1809; and there have been made similar boxes which, when opened by a false key, throw out a battery of cannon and shoot the invader.

The clink-stone indicates by its very name its sonorous qualities. The red granite of the Thebaid, in Egypt, possesses similar properties; and so musical are the granite rocks on the banks of the Orinoco, that their sounds are ascribed to witchcraft by the natives. In Brazil, travelers have seen large blocks of basalt which emitted very clear sounds when struck; and the Chinese employ this stone in the fabrication of musical instruments. But the most celebrated of these acoustic wonders is the "Jabel Nakous," or "Mountain of the Bell," a low sandy hill in the peninsula of Mount Sinai. Sir A. Smith distinctly heard sounds issuing from the celebrated granite statue of Memnon, in the morning, which sounds are ascribed by others to the same cause as the sound in granite rocks.


SPEAKING HEADS—STATUES OF MEMNON.

The speaking heads of the ancients were constructed for the purpose of representing the gods, or of uttering oracular responses. The speaking head of Orpheus, at Lesbos, is one of the most famous, and had the credit of predicting, in the equivocal language of the heathen oracles, the bloody death which terminated the expedition of Cyrus the Great into Scythia. Odin, who imported into Scandinavia the magical arts of the East, possessed a speaking head, said to be that of the sage Minos, which uttered responses.

There is an anecdote related of Rubini, the great tenor singer, which illustrates the peculiar power of the human voice. In an opera by Pacini, called "Il Talismano," in which Rubini was singing, he had to sing a phrase in which a high B flat occurs, which he was accustomed to attack and hold out with great power, to the delight of his audience. The public flocked to hear this wonderful note, and never missed calling for a repetition of it. Rubini had already sung the note on seven previous occasions, each time twice, and on one evening, when an admiring audience waited for the production of the wonderful note, Rubini was dumb. He opened his mouth, extended his arms and tried to utter the note which would not come. The audience cheered, applauded and encouraged him in every way, but the obstinate B flat refused to be sounded. One more effort, and the force of his powerful lungs overcame the obstacle, and the B flat rung among the audience with brilliant vigor; but something in the mechanism of his voice had given way, and, though feeling acute pain, he continued the scene, forgetting his suffering in the triumphant conquest he had obtained. When he left the stage, he saw the surgeon of the theatre, who examined him, and found that in the exertion of producing the obstinate note, he had actually broken his collar-bone. Exercising a little caution in his acting, he positively sung through the remainder of the season with a broken clavicle, very few of the audience discovering that he had suffered any injury in his endeavor to please them.

Another authentic instance of the power of sound took place during the rehearsal of the music for the Duke of Wellington's funeral. The rehearsal took place in one of the parish churches near to St. Paul's Cathedral, the whole available space being filled with singers, and during a passage in unison in an anthem written for the occasion, called "A Prince is Fallen in Israel," at one note sung loudly by all the voices, some six or eight of the gas-glasses echoed the sound, and burst into fragments. Chéron, a celebrated French bass singer, could break a tumbler into a thousand pieces, by sounding into a thin glass the fundamental note it naturally gave out. Ivanoff, the Russian bass, could also do the like.

Sir David Brewster says buildings have often been thrown down by violent concussions of the air, occasioned either by the sound of great guns, or by loud thunder, and most serious effects upon human and animal life have been produced by the same cause. Most persons have experienced the stunning pain produced in the ear, when placed near a cannon that is discharged. Deafness has frequently been the result of such sudden concussions, and if we may reason from analogy, death itself must often have been the consequence.

Bells were not always made in the shape or of the materlal with which we are most familiar. The earliest church bells are said to have been used at Nola, in Campania, and it is to this fact that the Latin name for a bell, *campana*, and our own *campanile*, owe their origin. They are first heard of about the year 400, before which date rattles were used. In the year 610 we hear of bells in the city of Sens; the army of Clothaire, king of France, having been frightened away by the ringing of them. In 960 the first peal of bells was hung in England, at Croyland Abbey, in Lincolnshire. They were six in number. In those early times, it was the custom to bless the church bells by a sort of baptism; after which it was believed they had power to drive away evil spirits, avert tempests and extinguish fire; and on many bells inscriptions are found, generally in old Latin rhymes, which accord with this belief. The great bell of Ghent, which played so prominent a part in the civil struggles in the Netherlands, and which bore the name of Roland, was famous for an inscription of this nature.

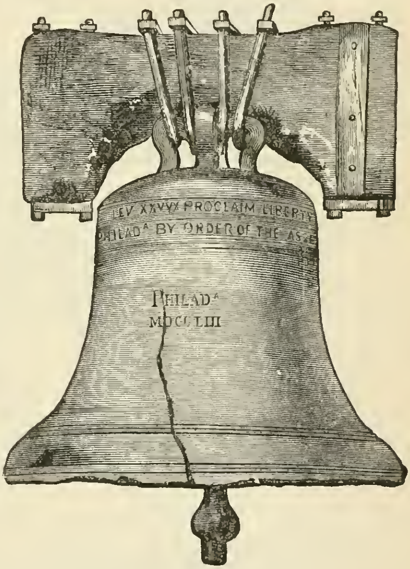
One of the single bells that have become celebrated on account of their great size is that at Moscow, the largest in the world, weighing four hundred and thirty-two thousand pounds. Big Ben, in the tower of the Houses of Parliament, London, weighs fifty-six thousand pounds. The bell at Florence, notwithstanding its great weight, is elevated two hundred and seventy-five feet from the ground. Big Ben is raised to the height of nearly two hundred feet. The enormous bell at Moscow was presented to the cathredral by the Empress Anne. In 1731, the beam to which it was fastened was burnt, and this marvelous bell falling, a fragment was broken out of it, leaving an opening large enough to admit two persons abreast without stooping. Its tone, however, was not affected. It has been thought that the custom of ringing tunes upon bells was peculiar to England; but, in fact, the Cathedral of Antwerp, celebrated for its magnificent spire, has a peal of ninety-nine bells, on which the most elaborate music is played every half-hour. It is an interesting fact that the peal of bells in the clock-tower of the old Royal Exchange, London, was chiming "There is nae luck aboot the house," when the building was on fire, and fragments of the tune were heard as one by one the bells fell from their places into the ruins.

The most celebrated bell in our country is not remarkable for size, but it has a history, and there are historic associations connected with it which render it an object of peculiar interest. Hanging in Independence Hall, Philadelphia, is the famous old Liberty Bell, which rang out with no uncertain sound when the Declaration of Independence was signed, and the patriotic founders of the nation declared that the people should be free. The bell bears this inscription taken from the book of Leviticus: "Proclaim liberty to all the inhabitants of the land." A crack disfigures the bell, and it is never rung, but it is a relic which is sacredly treasured.

A SINGULAR OCCUPATION.

Snake-charming is a very ancient art, and we find occasional allusions to it in the Old Testament, as well as in classic writers. But it is in India that the art of snake-charming has attained the highest degree of success, its secrets being so well handed down that it is commonly practised by the Hindoos at the present day.

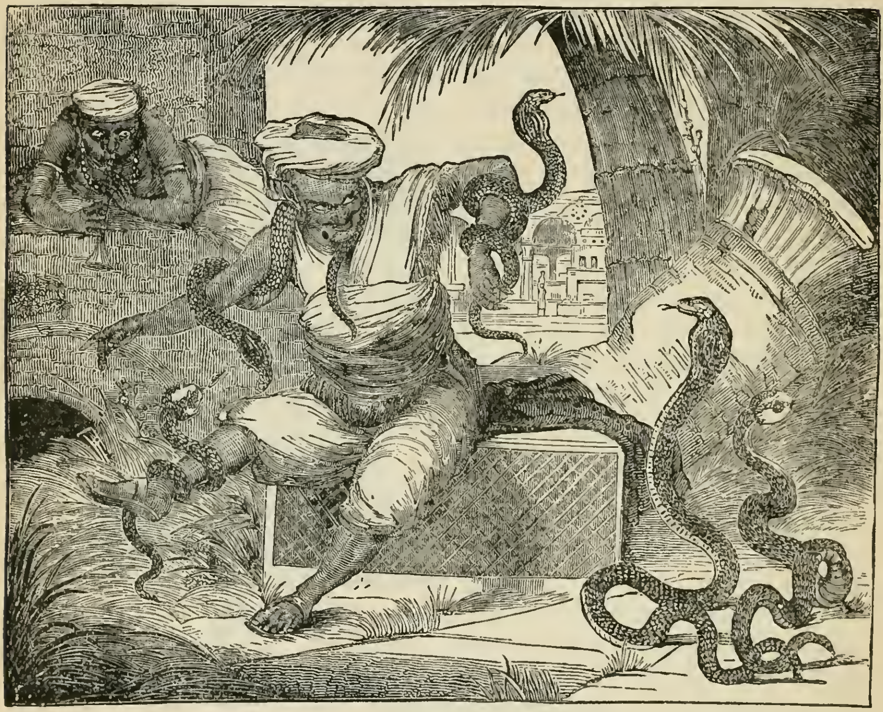
The Indian snake-charmers wander from village to village, and from town to town, with their snakes carried in baskets. They exhibit their skill chiefly for the amusement of the people, but often turn it to useful account in luring dangerous serpents from their lurking-places in houses, banks, or old walls. The chief agency in the charm is music, and this of the most indifferent kind, consisting of dismal tunes slowly played on a pipe something like a flageolet. The Hindoo conjurer affects also to exercise a spell on the reptiles by means of the voice alone, but this is believed to have no foundation in fact.



THE OLD LIBERTY BELL.

The mode of exhibition by the snake charmer is usually the following: setting down his basket of snakes, which has been covered with cotton wool, he produces his pipe, and performs upon it a few droning notes. The snakes come out from the basket upon the ground, and as the juggler continues playing, seem much delighted, erecting themselves about half their length from the ground, and keeping time by graceful undulatory motions of the head and neck. At times twenty of the serpents may be seen thus dancing together, with hundreds of natives looking on. After the dancing has continued some time, the juggler, seizing one or more of the snakes, will coil them round his head and neck, playing with them fearlessly, and apparently having them under his entire control.

The snakes which generally form the subject of exhibition, are the kind most dreaded of all—the cobra di capello. It has often been supposed that before the juggler exhibits his snakes he has carefully extracted the poison-fangs, and hence that his tricks, daring as they sometimes are, may be performed in perfect safety. This, however, is not always the case. Cobras from which the fangs have been drawn are frequently among the snakes which the charmers carry, but it has been proven again and again that in many of them the venomous powers are still unimpaired. The possession or the abstraction of these powers does not affect the peculiar sensibility of the snakes to the influence of the monotonous music of the Hindoo pipes; and in this undoubted susceptibility consists the secret of the power and control of the conjurer over the reptiles.



AN ORIENTAL SNAKE-CHARMER.

Many fatal accidents have arisen from persons having vainly imagined that the jugglers' snakes have been rendered harmless. A traveler thus relates his own narrow escape: among my drawings is that of a cobra di capello, which danced for an hour on the table while I painted it. I frequently handled it, to observe the beauty of its spots, and especially the spectacles on the hood, not doubting that its fangs had been previously extracted. But the next morning my chief servant, a devout Mussulman, came to me in great haste and desired I would instantly retire and praise the Almighty for my good fortune. Not understanding his meaning, I told him that I had already performed my devotions. Mahomet then informed me that, while purchasing some fruit in the bazaar, he saw the man who had been with me on the preceding evening entertaining the country people with his dancing snakes. The peasants, according to the usual custom, sat on the ground round the charmer, when, either from the musie stopping too suddenly, or from some other cause of irritation, the vicious reptile, which I had so often handled, darted at the throat of a young woman, and inflicted a wound of which she died in about half an hour.

It is a remarkable peculiarity in the cobra di capello, and in most poisonous reptiles of this class, that they seem to have a great reluctance to put into operation the deadly powers with which they are endowed. The cobra scarcely ever bites unless excited by actual injury or extreme provocation; and even then, before it darts upon its aggressor, it always gives him timely notice of his danger in a way not to be mistaken. It dilates the crest upon its neck—a large flexible membrane, having on the upper surface two black circular spots, like a pair of spectacles; it waves its head to and fro with a gentle undulatory motion, the eye sparkling with intense lustre, and commences a hiss so loud as to be heard at a considerable distance—so that the juggler always has warning when it is perilous to approach his captive. The snake never bites while the hood is closed; and so long as this is not erected, it may be approached and handled with impunity. Even when the hood is spread, while the creature continues silent there is no danger. Its fearful hiss is at once the signal of aggression and of peril. Though the cobra is so deadly when under excitement, it is appeased with astonishing rapidity even from the highest state of exasperation, merely by the droning music of the juggler's pipes.

A STORY OF A DIAMOND.

The diamond has always enjoyed an undisputed pre-eminence among precious stones, not only on account of its rarity, but also from its unequalled brilliancy. Some of these stones have been sold for almost fabulous prices, and many of the most celebrated diamonds known to exist have changed hands from time to time under strange and romantic circumstances.

Among the jewels formerly in the regalia of England was a diamond of great beauty and value, with which is connected a very remarkable history. It was once the property of Charles the Bold, last Duke of Burgundy, who wore it in his hat at the battle of Nancy, in which he lost his life. The diamond was found on the field after the battle by a Swiss, who sold it to a priest for a trifle, and it afterwards became the property of a French nobleman named De Sancy. The treasure remained in the possession of his family for more than a century, when one of his descendants, who was captain of the Swiss guard under Henry III. of France, was commissioned by the king to raise a new force from the same nation. Henry at length found himself unable to pay his soldiers, and in this emergency he borrowed the diamond from the Count de Sancy, that he might place it in the hands of the Swiss government as a pledge for the fulfilment of his engagements.

The count entrusted the diamond to one of his most faithful followers for conveyance to the king; but the messenger and the treasure disappeared, to the great consternation both of Henry and De Sancy. The most diligent search was made, but without furnishing any clue to the mystery. So strong was De Sancy's confidence in the perfect probity of his servant, that he felt convinced some misfortune must have happened to him; and he persevered in his inquiries, until he at length discovered that his follower had been waylaid and murdered by a band of robbers, and the body concealed in a neighboring forest.

De Sancy ascertained the locality, and instituted a careful search, which resulted in the discovery of his messenger's remains. He next gave directions to have the body opened; when, to the astonishment of all but De Sancy himself, the treasure was discovered. It was now clear that the poor fellow, on finding himself beset beyond the possibility of escape, had swallowed the diamond rather than that it should fall into the hands of the robbers. The story has been commemorated in the appellation the diamond has ever since borne of "the Sancy." The diamond was purchased for the Crown of England; but James II. carried it with him in his flight to France in 1688. Louis XV. is said to have worn it at his coronation. In 1835 it was purchased by a Russian nobleman for four hundred thousand dollars.

GREEK FIRE.

"Greek fire"—or, as it was sometimes called, "Saracen fire"—was the most important war material men had before the invention of gunpowder. Twice the city of Constantinople was saved by the use of it. It is said to have been invented by a Syrian, who, deserting from the service of the caliph, revealed his secret to the emperor. The ingredients, if not also the mode of darting the fire, were kept a secret for upwards of four hundred years, and it is quite uncertain now what were actually the component parts of that which, Joinville says, "came flying through the air like a winged, long-tailed dragon, about the thickness of a hogshead, with the report of thunder and the velocity of lightning; and the darkness of the night was dispelled by this deadly illumination." It is generally considered, however, that "the fire" was composed of naptha, mingled in certain proportions, now unknown, with sulphur, and with pitch obtained from evergreen fir. This mixture, ignited and blown or pumped through long tubes of copper, which were mounted in the prows of galleys, and fancifully shaped into the form of monsters, produced a thick smoke with a loud explosion, and a flame, fierce and obstinate, which no amount of water could put out. When used for the defence of walls, it was poured in large boilers from the ramparts, or was hurled on javelins by means of tow which had previously been steeped in the inflammable material. Against it the bravest soldiers went in vain; their imagination recoiled from a thing so subtle and terrible. Horses fled from it in dire fright; ships were burnt by it; there was no way of standing against it.

The Greek emperors, sensible of the enormous advantage which an offensive weapon of such a kind gave them, invested it with a mysterious history, and appealed to the superstition of their subjects for the preservation of the secret of the manufacture. They said that an angel had revealed the composition of Greek fire to the first Constantine, for the express purpose of maintaining the superiority of the empire over the Barbarians; and that whoever betrayed the secret to foreigners would incur not only the penalties of treason and sacrilege, but the special vengeance of the Almighty. In the twelfth century, however, we find it used by the Mahometans in their wars with the Christians; and from that time it came into pretty general use, until the invention of gunpowder put it out of date, and caused an entire revolution in the art of war.

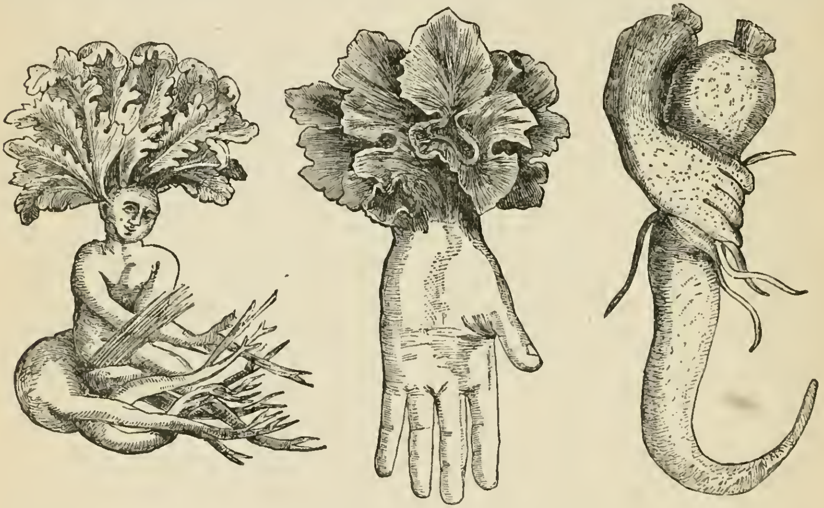
WONDERS OF VEGETATION.

Some striking resemblance in vegetation to the human form is by no means an uncommon phenomenon, and many are the legends to which wonders of this kind have given rise. There is the story of the mandrake, for example, which is said to shriek when it is pulled out of the ground. Avicenna relates that a Jew at Metz had a mandrake preserved in spirits which had a human head, and the legs and body of a cock. This may have been, for a book might be filled with similar marvels; but what shall we say when the same authority informs us that the mandragore of Metz lived five weeks, and was fed on grains of lavender and earthworms?

The accompanying sketch represents three of the most remarkable vegetable oddities which have been noticed, and it will be seen from our account of them that there is no reason to believe that the representations, which are copied from old prints, are exaggerated.

The turnip with a human face grew in a garden at the village of Weidan, between Bonn and Juliers, in Germany. It will be observed that the leaves resemble hair standing up, or feathers such as ladies wear when attired in court costume. On the round part of the root there are marks resembling eyes, nose and mouth. By a very slight effort of imagination, the entwined roots will be thought to resemble arms and legs; and the whole bears a very close resemblance to a female figure adorned with a head-dress, sitting cross-legged, with her arms folded.

The radish represented in the next figure grew in a sandy soil at Haarlem, and was painted from life. From this picture an engraving was made, from which, again, our copy is taken. Another radish, exactly resembling a human hand, was in the possession of a curiosity seeker, who declared that the fingers were quite perfect, and that a large sum had been offered for it and refused.



CURIOSITIES OF VEGETATION.

Equally remarkable was the root of the parsnip shown in our engraving, which represented the back of a hand so perfectly that it could not be surpassed by the best painter. This root was bought of a market-woman in the usual way, and passing from one person to another, at last fell into the hands of an engraver. One writer testified to having seen a parsnip which exactly resembled a man, but we are not aware that any drawing of it was ever published.

On the way from Porto Santo to the summit of the Peak of Teneriffe, is situated the considerable town of Orotava. It is now of little importance compared with the towns on the coast, and indeed it is best known as the summer retreat for the wealthier inhabitants of Porto Santo, being about six thousand feet above the level of the sea. It was formerly the capital and court of the principal kingdom of the Guanches. It is everywhere known as the place where, until 1867, grew the famous dragon tree celebrated for its great antiquity. Humboldt considered it to have been five thousand or six thousand years old. Sir John Herschel supposed it to be the oldest tree in the world. Other writers make it so old as to have witnessed some of the last revolutions which the surface of the planet underwent previous to the advent of man.

Its immense hollow trunk was used centuries ago as a temple by the Guanches. The victorious Portuguese, finding it suited for this purpose, dedicated it in the beginning of the fifteenth century to Christian worship. It subsequently suffered greatly from natural causes, as well as from the ruthless vandalism of travelers and curiosity hunters. In the beginning of the present century it lost an immense arm, and decay was rapidly telling upon it when it fell into the hands of its last proprietor, who did all he could to preserve this patriarch of the vegetable world. A terrible hurricane which swept over this part of the island in the autumn of 1867, threw it down and completely destroyed it.

The youngest trees of this species consist of simple stems of equal diameter throughout, marked with transverse scars produced by the bases of the former leaves, and terminating in a round head of radiating, sedge-shaped, stiff leaves. For twenty years or so from its springing from the seed, the dragon tree retains this appearance, growing only in height. It then flowers, and after flowering, a whorl of three or more branches is produced, each repeating the appearance and passing through the history of the original stem. This now increases in size, the external transverse markings disappear, and a rough, irregular outer surface is formed with numerous perpendicular fissures and scars. Another period of flowering arrives—for another twenty years the tree has been simply vegetating and preparing nourishment for the vigorous production of flowers and fruit—and now every branch bears its clusters of flowers, which are in time changed into glistening vermilion berries. Then each branch produces a whorl of branches, and by the numerous vascular bundles which it sends down towards the ground, and on the outside of the old stem, greatly increases it in size.

THE DEAF AND DUMB ALPHABET.

There is always a number of persons who, having lost the power of hearing, commonly through some form of disease, have also lost the power of speech, and are compelled to make use of signs. That the deaf and dumb, who are unable to articulate a single syllable, should yet be able to talk as accurately as though they could speak with tongue and lips as other people do, shows the benevolent interest taken in those who, for any reason, are unfortunate, and comparatively helpless. The hands are made to speak. As far as possible, the form of the letter made by the hand corresponds with that of the letter in the alphabet, and it will be noticed that in many of the mute letters there is a resemblance to the original letter intended to be represented. By the use of these signs mutes are able to converse as readily as if their vocal powers were unimpaired.

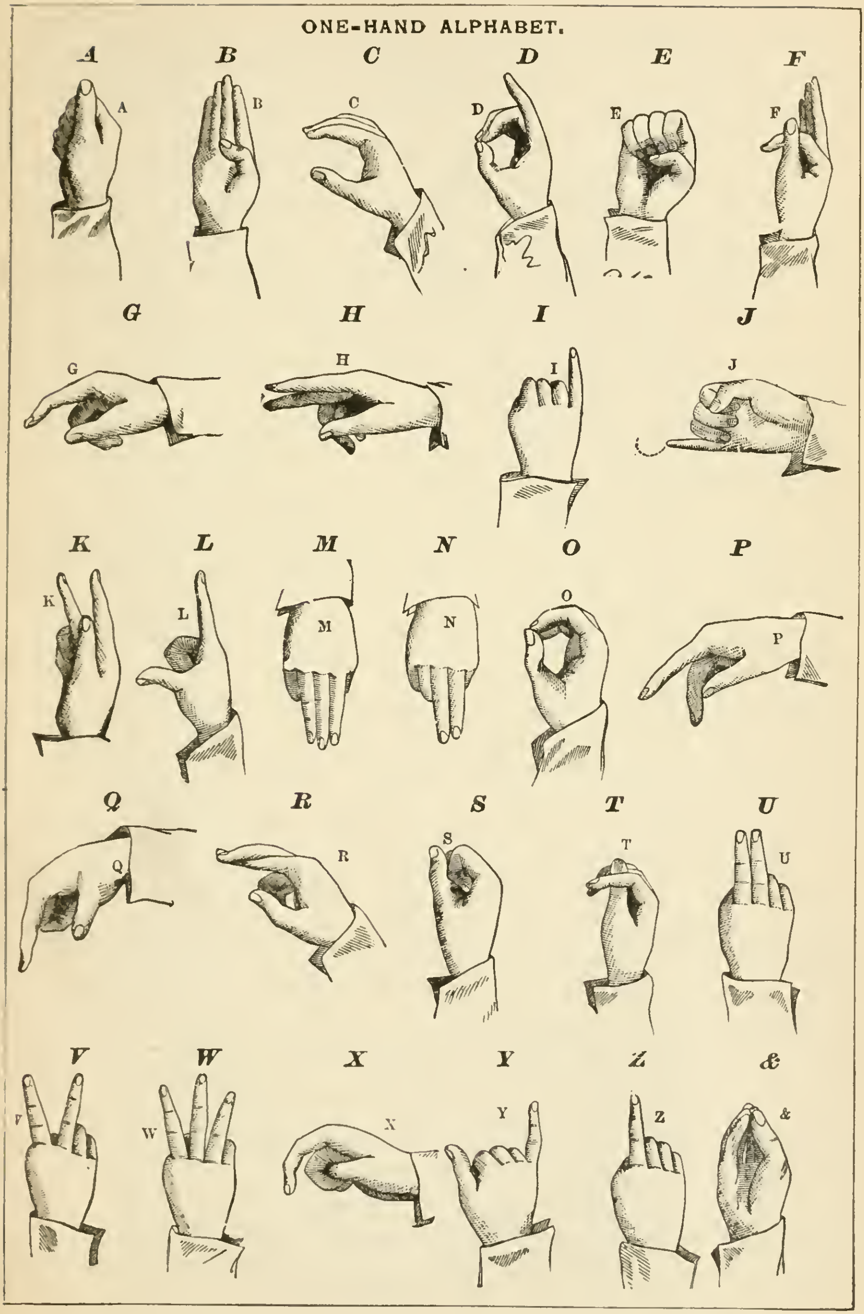
By constant practice the hand at length forms the various signs with great rapidity. In many instances it is unnecessary to spell a word out, letter by letter, but by contractions and simple signs which stand for words or phrases the conversation is expedited, and is not by any means the slow process one would suppose it to be. A skilled interpreter of the deaf and dumb alphabet can translate a discourse delivered by a public speaker, who is deliberate in his utterance, so that a company of mutes would get a very good idea of the meaning. Of course words could be spelled out in the sign language in only a few instances, yet by signs well understood, each carrying a separate idea, the meaning of the speaker could be discovered.

It is happily true that they who cannot speak audibly are not shut out from all communication with their fellows. Great interest has recently been taken in the education of mutes, and the effort to teach them to speak audibly has been successful, although the process is purely mechanical.

WONDERS REVEALED BY THE MICROSCOPE.

The philosophers of the present day, and especially M. Ehrenberg, have forced us to believe the marvelous fact, that whole mountains are chiefly formed by the mineralized remains of a class of beings, so minute that they cannot be distinguished without the aid of the microscope. In our own country, Professor Bailey, of West Point, by the same means, has not only confirmed the minute observations of Professor Ehrenberg, but has found that other minerals, not suspected by the former philosopher, are also composed of remains of these more than tiny insects. This is not the least of the wonders which the sciences of the present day have brought to light; and it is now not only well understood that formations of limestone and chalk are the works of infusoria, but also that they are contained in the hardest stones, as flint, chalcedony, opal and emery.

Professor Bailey says, that the fresh water infusoria are seen in the mountain brooks around West Point, the bottoms of which are covered in the first warm days of spring with a ferruginous-colored mucous matter, about a quarter of an inch thick, which, on examina-


ONE-HAND ALPHABET.
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SIGNS USED FOR LETTERS BY THE DEAF AND DUMB.

tion by the microscope, proves to be filled with millions and millions of these exquisitely beautiful silicious bodies. Every submerged stone, twig, and spear of grass, is enveloped by them; and the waving, plume-like appearance of a filamentous body, covered in this manner, is often extremely elegant.

If some water is taken out of a pond, from near the edge or close to the flags and grasses which grow close to the side, it will usually be found to contain, during the summer months, a number of large globular animalcules. A common magnifying glass will just distinguish some specks which appear to move very slightly, but a good microscope proves that these small points are animalcules in the form of transparent orange-shaped masses. Each consists of a fine membrane covered with lace markings, and at the edge there is a delicate fringe of moving hairs (ciliæ) which causes the animalcule to turn round and round, and occasionally to move forwards. These hairs are found all over the globular mass, and they move with great rapidity, so that the animalcule, which is called a volvox, is never still. Inside the membrane, and as it were in the middle of the creature, are several others of the same shape, and possessing the same lace-like markings and fine ciliæ. These revolve and turn about, and there may be even others inside them having the same construction and power of motion. They clearly float in water and within each other. There is no mouth, and, in fact, no opening whatever in the skin of the volvox, and a very highly magnifying power shows that the outside membrane is without any passage by which food can get within. It shows that the lace-like markings where they cross each other, have small swellings, some being larger than others. The smallest swellings are animalcules with a delicate round body full of granules, and from their outside the hairs project which are the ciliæ. Every small swelling has its animalcule and two ciliæ, and the cross-markings between the swellings are evidently the means of communication, for there is an extraordinary regularity in the general movement of the hairs so as to produce a constant and very slow twisting round of the whole volvox. Volvox is, then, a family or colony of animalcules, each being independent and united to the others by the fine membrane and the cross-markings. When the larger swellings are examined they do not appear to be simply large animalcules, but there are three, four or more of the smaller kind collected together and encircled by a layer of the thin membrane.

Several specimens of the volvox may be examined in a drop of water at once, and nothing is more beautiful than their regularity of ornament, their color, transparency and complexity, or more wonderful than their graceful rotation. If left in a proper glass, and if fresh water is supplied, the volvox grows larger, and the single animalcules on the cross-markings, in many instances turn to those of the larger kind. The inside animalcules increase in size, and after awhile the outside membrane bursts and breaks up. Each of the round creatures within becomes a volvox and bursts in its turn. But the animalcules of the outside membrane, those formed at the cross-markings, escape from the colony and swim about as free creatures. They are then recognized as round, green creatures, very active, and not at all like the old volvox. During some time they remain in this shape, but at last they begin to enlarge, and their outside skin begins to have hairs upon it and lace-like markings. Finally they turn to the great globular animalcules.

The rapidity with which the volvox grows, and produces animalcules within it and on its outside, which are again to become like the parent, is one of the most wonderful things in nature. Some of these pieces are as large as an apple, but usually they are of the size of a small pea. The stuff looks like pure white of egg; it is quite transparent, slightly tinged with green, and when placed on a piece of glass it drains away. But the microscope reveals that it is a colony of innumerable animalcules, each creature being about the hundredth part of a line in thickness, and the tenth of a line in length. The centre of the mass is hollow and contains water, and the animalcules are embedded in the jelly. Their numbers are enormous, for they are placed in close rows, one over the other. They have movable hairs upon one end, and they produce a great whirl amongst the small grains and minute animalcules which come near them. There are about nine thousand two hundred and sixteen of these creatures in the space of a square line, and in the space comprised by a mass measuring an inch in height, breadth and length, or a cubic inch as it is called, there are about eight million.

One of the most wonderful animalcules is in the shape of a wine-glass with a bell mouth. The bottom of the body is attached by a long thread to substances in the water, and the rim is covered with the long hairs called ciliæ. Several round grains are seen in the inside of the body, which is very transparent, and inside the delicate thread there is one long muscular fibril. When the hairs begin to move, the creature stretches its thread out and anchors. As soon as it cannot move any more the hairs produce a whirlpool all round the rim of the glass-shaped body, and the minute particles in the water, and small animalcules of different kinds are guided into the creature's stomach. When too large a piece comes in contact with the hairs, the thin fibre in the thread pulls the body back violently and curls itself up like a spiral spring, or in cork-screw fashion. After awhile the animalcule sets its ciliæ at work again, and the spiral shape of the thread is undone.

When the animalcule is well nourished it begins to split in two, and each division becomes a separate creature. If the thread should happen to break the animalcule must go forward until checked, and it is very common to see them swimming about without this attachment. After awhile they seem to lose it altogether and to become fixed before producing another elastic cable.

The achromatic microscope shows an ordinary hair to be indented with teeth resembling those of a coarse round rasp, but extremely irregular and rugged. And these incline all in one direction, from the origin of the hair towards its extremity ; so that if a hair be drawn between the finger and thumb from the end to the root, it will be distinctly felt to give a greater resistance and a different sensation to that which is experienced when drawn the opposite way. By the aid of the microscope, shells can be measured to the thousand part of an inch. Crystals can be obtained from an imponderable quantity of a substance, and those so characteristic that poisons can be thus detected when the substance for examination is too small to be submitted to tests. Sir David Brewster has detected, with a microscope, a fine down of quartz, the filaments of which could not exceed the one third of a millionth part of an inch. Professor Kelland has shown in Paris, on a spot no larger than the head of a small pin, by means of powerful microscopes, a specimen of distinct and beautiful writing, containing the whole of the Lord's Prayer written within this minute compass. The microscope detects the invisible ingredients which adulterate our food, our drink, and our medicines. It tells the murderer that the blood which stains him is that of his brother, and not of the other life which he pretends to have taken ; and, as a witness against the criminal, it, on one occasion, appealed to the very sand on which he trod at midnight. Hundreds of adulterations have been discovered, the detection of which was beyond the power of chemistry. Three distinguished chemists are known to have asserted it was impossible to detect the presence of chicory in coffee ; whereas, by the use of the microscope, the differences of structure in the two substances can be promptly discerned, no matter to what extent they may be pulverised, mixed, or even roasted. The microscope detects the most minute stains ; even of the millionth part of a grain we can have the most perfect view. And by the microscope it has been found that in certain Bohemian schists there are fifty-one millions of animalcules to the cubic inch, each skeleton weighing no more than the two hundred millionth part of a grain.

The art of photography shows us much that is both curious and amusing. For example, we are looking through the glass at a lovely river scene. The glow of a tropical sun is gleaming in the sky and in the waters, but as we look the scene changes. The clouds which had previously seemed to hang in the tropical sky, appear to move and to assume a dusky hue, the waters look sombre, the landscape begins to wear a deeper green, gradually the light dies away, and there remains the cool and quiet of an evening on the banks of the Potomac or the Hudson. This, like the invisible photograph, is but the application, with the additional artistic effects afforded by photography, and other improved means, of an old principle. The apparatus employed is a revolving cylinder, the edge or rim of which is strongly colored with the required hues, which are reflected upon the photographic plates according to the effect required.

Next to the above in curious interest, is what may be called microscopic photography, or the reduction of large objects into such small dimensions that the picture is invisible to the naked eye. One photographer produced a family group of seven full length photographs in a spot the size of a pin's head; and he states that it is only a question of trouble to include ten thousand portraits in a square inch. It was suggested that a diplomatic despatch might be conveyed in a spot no bigger than a full period. Since that time the idea has been worked out in a variety of ways, a full page of one of our largest newspapers having been potographed in so small a space. The enlargement of photographs, though less wonderful to the common apprehension than their reduction to the infinitely small, is, practically, not less interesting and curious. By means of the solar camera, photographic cartes are magnified to the size of life. The effect is very striking and beautiful.

But the most striking photographs of this topographical character are those which have been taken in balloons floating some four thousand feet above the earth. The first experiments of this kind were made by Mr. Negretti in Coxwell's "Mammoth" balloon in the summer of 1863. They were regarded with much interest at the time, as several problems were involved in success or failure—such, for example, as the difficulty of operating at all in a moving tent, and the question whether the actinic power of the solar rays would be as effective up aloft as on the surface of the earth. It was not only the onward motion of the balloon that created a difficulty, but its rotating motion, to obviate which a good deal of ingenuity in constructing and working the apparatus was needful.

One more of the surprising effects of photography remains to be mentioned here—viz., its application to illustrate geometrical figures and problems. This followed rapidly upon the discovery of the principle of the stereoscope. Every one who has gone through the eleventh book of Euclid is aware of the great difficulty which is superadded to that of the problem itself by the number of lines crossing each other on a flat surface. By producing these lines on stereoscopic slides, they are made to appear as if the figure was made of wires stretching from point to point in space. Planes are seen to intersect each other with as much distinctness as if they were sheets of card-board inclined at various angles; and solid angles and pyramids have their edges and angular points in such tangible relief that a model could not afford a better illustration of the text. The letters, too, are so contrived as to appear to belong to the points to which they refer, and to stand out at the proper distances from the spectator.

Before concluding this article we may also notice some remarkable instances of grotesque or caricature photography. When the lamented Lincoln was president, his photographic portrait was exhibited, and to the naked eye appeared as if pitted with the small-pox. On examining the dots with a microscope, they were found to consist of portraits of generals, politicians, divines, poets, actresses and other well-known characters suitably placed. Jeff Davis would be found in the president's eye; McClellan on the tip of his nose; Miss Cushman on his lips and so on. All these likenesses were said to be very striking, and the whole caricature was regarded as a felicitous performance. Something of the same comic character was done in Rome, when well-known figures, suggestive of a satirical application, were published with the heads of public characters. Thus the face of Antonelli appeared on the shoulders of Fra Diavolo; and the queen of Naples was made to figure as Moll Flagon. Even the Pope himself was not spared. The speedy result, however, was a Papal edict against the enormity, by which the photographic artists were subjected to the loss of their places and instruments, a fine of one hundred dollars and a year in the galleys! The models who dared to sit for such figures were denounced in the same penalties.

Instantaneous photography is now rapidly coming into use. By means of a very sensitive plate and an instantaneous slide an impression can be made of animals in motion, and a correct likeness obtained. The fastest trotting horse can be made to show the exact position of his feet as he darts past the instrument. It is something to say that the photographic art has been so perfected that an impression can be taken with the quickness of a flash of lightning.

Moving photographic figures have been popularized by the production of a toy called the Wheel of Life. The idea is an old one, and the process consists in producing an appearance of motion by the recurrence of certain images on the retina of the eye. The principle is simply this: the retina retains for a short time any impression made upon it; if, therefore, a second impression can be produced before the first has died out, the two combine to form an uninterrupted sense of vision. Familiar instances of this law will occur to everyone. The appearance presented by the spokes of a wheel in rapid motion; the circle of fire produced by a spark at the end of a stick, when the stick is whirled round, are cases in point. It is only fair to state that we are indebted to the ingenuity of one of our own countrymen for the enjoyable manner in which the Wheel of Life is now presented to the public. One marvel, however, suggests another, and there is reason to believe that our winter evenings will soon be enlivened by another adaptation of the same idea. A clever designer has prepared diagrams which represent persons in the act of swimming and skating, a cat springing upon a rat at the moment of its disappearance down a hole, a ball leaving a cannon's mouth, and fish swimming in a stream. The most curious of these is the appearance of men swimming. They are all alike seen horizontally, the diagram being placed at the bottom of the Wheel of Life as in a tray.

CURIOSITIES OF GLASS-MAKING.

Of the manufacture of glass it has been said that, although perfectly transparent itself, not one of the materials of which it is made partakes of that quality. Its origin is uncertain. Josephus claims the discovery for the Israelites; Pliny assigns it to the Phœnicians, and states that the first glass-houses were erected in Tyre, where the only staple of the manufacturer existed for many ages. Herodotus and Theophrastus likewise confirm the fact of the use of glass having been known in the earliest periods of civilization, and of the establishment of glass-works in Egypt and Phœnicia, and even in India, where rock crystal was employed in its composition.

The art of making glass is reputed to have been discovered by accident. Pliny states, some Phœnician mariners who had a cargo of *nitrum* (salt, or, as some have supposed, soda) on board, having landed on the banks of the Belus, in Palestine, and finding no stones to rest their pots on, placed under them some masses of *nitrum*, which, being fused by the heat with the sand of the shore, produced a liquid and transparent stream. Now the sand which lay about half a mile round the river was peculiarly well adapted for the making of glass. The Sidonians, in whose country the discovery was made, took it up, and in process of time carried the art to such perfection that they are even said to have invented glass mirrors. Yet the manufacture of glass was, a few years since, unknown at Sidon, where it is reputed to have been first invented. The above account by Pliny is, in substance, corroborated by Strabo and by Josephus; yet it was long asserted that the ancients were unacquainted with glass, properly so called. Nor did the denial entirely disappear even when Pompeii presented evidence of the skill of the ancients in glass-making.

The process of manufacture detailed by Pliny appears to have been very much the same as that practised at the present time. And Sir George Gardner Wilkinson gives the representation of two glass-blowers inflating a piece of molten metal, by means of hollow tubes, taken from a painting of Beni Hassan, executed during the reign of that monarch, who lived about three thousand five hundred years ago; and adds that glass vases, if we may trust to the Theban paintings, are frequently shown to be used for holding wine as early as the Exodus, about one thousand four hundred years before the Christian era. Such was the skill of the Egyptians in glass-making, that they successfully counterfeited the amethyst and other precious stones worn as ornaments for the person. Winckelman, a high authority, is of opinion that glass was employed more frequently in ancient than in modern times; it was used by the Egyptians not only for drinking vessels, but for mosaic work, the figures of deities and sacred emblems, in which they attained excellent workmanship and surprising brilliancy of color. The remains of Alexander the Great are said by Suetonius and Strabo to have been delivered to Augustus, when he was in Egypt, in a glass-case in which Seleucus had deposited them after removing them from a golden urn. Glass was used by the Egyptians for coffins, and in 1847 a process was patented in England for making coffins of glass. It would be reasonable to suppose that the Hebrews brought glass, and a knowledge of its manufacture, out of Egypt, were not the evidence of history so explicit that it was actually discovered and wrought at their own doors.

Archimedes is stated to have constructed an orb of glass for scientific purposes; and optical glass has been found at Nineveh, in a microscope glass. There is also, in the British Museum, a perfect and beautiful goblet, excavated by Layard from among the ruins of Nineveh. It has a name—probably that of the contemporary sovereign, or of the maker—engraved upon it; and from the characters employed, and the locality in which it was found, it is believed to be of date seven centuries before the Christian era, and probably the most ancient piece of manufactured glass in existence.

In the reign of Tiberius, glass-works were first established near Rome, and various sums were paid for vases or goblets. Glass was not only an article of luxury or ornament in the palaces, but employed to decorate altars and the tombs of the dead. Many fragments have been found in the catacombs, showing it to have been used likewise by the early Christians in their places of worship. In the above reign a Roman artist had, according to Pliny, his house demolished (according to others, he was beheaded) for making glass malleable. The Pompeian and Roman architects are known to have used glass in their mosaic decorations; of these, remains have been found among the ruins of the villa of the Emperor Tiberius, in the island of Capri. Several specimens are also yet to be seen in Westminster Abbey, cemented into the sides of the tomb of Edward the Confessor in flat pieces, the under layer reddish and opaque, and the upper white and transparent, gold leaf between, and the whole fixed into one substance.

The clear glass resembling crystal was so costly, that Nero gave for two cups of no extraordinary size, with two handles, nearly two hundred and fifty thousand dollars. Glass vessels are made to imitate precious stones, cut by the lathe in the style of cameos in relief, by Roman artists. In the British Museum are preserved many fragments of vases of white opaque enamel glass upon blue and amethyst grounds. White crystal glass without lead, cut to imitate rock crystal, was then known; and a few pieces of this cut glass, considered Roman, have been found in the old Roman wall of the city of London.

The following curious anecdote is related by the German traveler Kohl, in his work on Russia. The Emperor Nicholas wished to illuminate the Alexander column in a grand style. The size of the round lamps to be used for the purpose was indicated, and the glasses bespoken at the manufactory, where the workmen exerted themselves in vain, and almost blew the wind out of their bodies in the endeavor to obtain the desired magnitude. The commission must be executed—that was self-evident; but how? A great premium was offered to whoever should solve this problem. Again the human bellows toiled and puffed. Their object seemed unattainable; when at last a long-bearded Russian stepped forward, and declared that he could do it—he had strong and sound lungs, he would only rinse his mouth first with a little water to refresh them. He applied his mouth to the pipe, and puffed to such purpose that the vitreous ball swelled and puffed nearly to the required dimensions, up to them, beyond them. "Hold! hold!" cried the lookers-on, "you are doing too much; and how did you do it all?" "The matter is simple enough," answered the long beard; "but, first, where is my premium?" And when he had clutched the promised bounty, he explained. He had retained some of the water in his mouth, which had passed thence into the glowing ball, and there becoming steam had rendered him this good service.

Venice possessed the art of glass-making almost as early as the foundation of the city itself. An immense trade in beads, imitations of pearl and precious stones, was carried on with the coasts of Asia and of Africa, and extended to India and to China. The revival of art in Italy improved the design and colors of Venice glass; her mirrors, her table-glass, of variegated colors and spiral stems, her bottles and cups, obtained high reputation, and for a time supplied the wants of Europe, Africa and Asia. Judging from curious specimens extant, the Venetian glass-blowers must have been skilful artists. A glass Venetian knife-handle, with a coating of white transparent glass, including differently-colored glass fused into one variegated mass, is very beautiful, and the Venetian ball is a similar specimen of ingenuity. But the white glass of Venice was far inferior in pellucid refractibility to modern English crystal glass. The finest ancient Venetian glass is rather celebrated for its lightness than crystalline beauty. The Venetians also originated the modern style of glass engraving: the first specimen was scratched with a diamond, or broken steel file, but the engravings produced by copper and lead wheels are far superior. The Venetians also revived the curious ancient art of forming mosaic glass pictures, and in the present day Venice is unrivalled for its cheap and excellent glass bugles and beads. The Venetians were celebrated for their *filagree* spirally twisted white and colored enamel glasses, cased in transparent glass, much used in the stems of wine-glasses; *millefiore* glass—ends of fancy-colored tubes, cut sectionally at right angles with the filagree cone, to form lozenges and tablets, massed together by transparent glass; and *vitro di trino*—fine lace-work, intersected with white enamel or transparent glass, in diamond-shaped sections, the centre of each having an air-bubble, executed almost with the precision of engine-lathe turning.

In the manufacture of glass the Bohemians followed the Venetians, and the art is still largely practised in that country. The glass works of Bohemia at this day afford subsistence to more than thirty thousand persons. Glass was first used by the Italians for cameos and intaglios, by impressing it while warm into a mould of tripoli, the glass being sometimes baked with plaster of Paris; thus are made copies of antique gems. The more ancient productions were only partially enclosed, as we see in the picture of a duck described by Winckelmann, or the arabesque mosaic in the British Museum, the paintings being neither completely enclosed nor protected from the air. Among the celebrated ancient specimens is the Naples Vase, exhumed at Pompeii, 1839. It has white enamel figures upon a dark blue transparent ground, being raised or embossed out of the white exterior coating by first-rate engravers, probably Grecian artists working in Rome, about seventy years after the Christian era. The mode of casting, or placing two or more coats of glass upon each other, and then cutting out the design, is very curious.

There is also a beautifully engraved glass vase, by a Bohemian artist, the subject from Le Brun's painting of the conquest and final overthrow of the Persians at the battle of Arbela, by Alexander the Great. For depth of workmanship and artistic execution, as a modern intaglio engraving, this vase was unrivalled. It has been stated that the artist lost his sight through its execution.

THE WONDERS OF POISON.

The mysterious power by which life is sustained is only to be equalled, in point of interest, by the numerous materials which exist in every department of nature capable of destroying it. The atmosphere has its gases and floating germs, which oftentimes produce disease and cause death. The same poison which drove the first settlers from the Palatine Mounts, has given its fevers and agues to inhabitants of various parts of the globe—from the ditches of Holland to the dense jungles and low swamps of the tropics. And the land of Tusculum, in bygone ages, witnessed death from pestilential effluvia, as the banks of the Ganges do now.

That subtle agent of death, carbonic acid, issues from the lungs of the healthy human being at the rate of one thousand three hundred and ninety-three cubic inches per hour, as if contending with the fabled stream of death. The vegetable world has, pervading some of its beautiful members, insidious juices which, when taken into the system, speedily prove fatal. The earth has embedded in its strata substances equally as destructive to life; while Nature has armed several species of the animal kingdom—creeping, walking and flying—with poison-darts of a formidable nature as instruments of defence, which can seriously affect the natural progress of life, and in many instances prove fatal to its continuance. Poison exists everywhere, and lack of knowledge of the insidious enemy often proves a source of death. Poisonous fungi have been mistaken for edible ones; aconite root for horse-radish; fools' parsley for common parsley; while many of those agents which man has artificially prepared to alleviate suffering, and ward off the attacks of disease—in the hands of the careless, the ignorant and the vicious—have oftentimes proved a terrible source of death. Poisons may be introduced into the system, by swallowing, by the breath, through the medium of the lungs, and from the surface of the body.

Claude Bernard has shown that the more active poisons destroy life, by attacking particular organs or tissues, essential to it. Thus the wourali poison paralyzes the motor nerves; strychnia attacks the sensitive portion of the nervous system, and excites fatal reflex action; while digitalis, veratria and several other poisons, act on the muscular tissue throughout the body.

Different effects are oftentimes produced by the same substances, on man and animals. Thus Beck asserts, that sweet almonds kill dogs, foxes and fowls, while aloes are destructive to dogs and foxes, pepper to hogs and parsley to the parrot. The influence of the same poison on different individuals, is indeed wonderful. Some are as peculiarly susceptible to their action as others are callous to them. Many people cannot take opium, others are severely affected by the smallest doses of mercury, and Epsom salts even have been known to produce alarming symptoms of irritant poisoning.

The hornet is one of the most venomous insects found in this country, though, as a rule, the sting of either the hornet, bee or wasp does not cause much inconvenience. Instances have, however, been known where great fever and constitutional disturbance have been produced by them. Bees have proved more formidable in an indirect than direct way; namely, from gathering honey from the flowers of poisonous plants. Xenophon tells us, that during the retreat of the ten thousand, a number of Greek soldiers were violently affected by honey which they had eaten near Trebizond. In 1834 a specimen of this honey, which still retained its poisonous qualities, was discovered. In 1790 an extensive mortality was produced amongst those who had partaken of honey collected in the neighborhood of Philadelphia. It was afterwards ascertained that the honey had been chiefly collected from a poisonous flower.

The scorpion is one of the most venomous insects in southern countries. Its sting causes great local inflammation, with more or less fever, trembling and pain. Animals sometimes die from the effects of the scorpion's sting. The bite of the common viper rarely proves fatal to human life, though its venom is sufficiently powerful to kill the lower animals. The Abbé Fontana, who investigated this poison in every possible point of view, found it harmless when swallowed. It is a yellowish, viscous liquid, neither acid nor alkaline, and without definite taste. The bite of the viper is not hurtful to another viper, or to cold-blooded animals, as leeches and frogs.

The bite of the copra di capello is exceedingly dangerous, and rapidly proves fatal. A keeper at the Zoological Gardens, in London, was bitten on the nose by a cobra, and died in ninety-five minutes. There was no swelling, though there was a slightly pinkish hue of the eyelids, difficulty of breathing, stupor, paralysis of the limbs and speedy coma. The chief *post mortem* appearances were a dark, fluid state of the blood, which emitted a sour and sickly smell, and intense congestion of the internal organs. The bite of the rattlesnake is also rapidly fatal. Sir Everard Home mentions a case of a man accidentally bitten twice in the hand by a rattlesnake, kept for the purpose of exhibition in London. He died eighteen days after being bitten.

Besides the above-mentioned, there are other animal poisons. The rabid dog, excited either to intense ferocity, or unusual docility, by the virulence of the poison circulating through his system, can communicate this disease known as hydrophobia, to man and other animals; and, dumb with madness and thirst, longs in vain for one drop of water to cool his parched throat. The horse also, under certain conditions, becomes affected with two diseases, known as glanders and farcy, both of which are communicable to man. A case is on record of a man who died of glanders. The nurse who attended him inoculated her hand, and died also in a few days. Two kittens inoculated from the nurse, became likewise affected. Bites received in personal combats between human individuals have been known to exhibit every symptom of poison. The saliva and tartar of the teeth are mentioned as the deleterious substances in these cases.

Many cases are on record proving the poisonous nature of various species of fish. Some are constantly poisonous; others only occasionally so. The conger eel, yellow-billed sprat, land crab, mackerel, oysters and mussels, are amongst those enumerated. The latter (mussels) not unfrequently produce severe symptoms, such as violent oppression and agony; swelling of the face; a scarlet efflorescence over the body; insatiable thirst and vomiting. In fatal cases there is coldness of the extremities, delirium, hiccough, and, occasionally, coma. The treatment of poisoning in such cases mainly consists in the free use of emetics and purgatives.

Diseased meat and dissecting wounds are also productive of fatal results. The most speedily fatal case on record, from a dissecting wound, is that of a gentleman who died forty hours after the receipt of the injury. Not unfrequently severe symptoms arise from inhaling the effluvia which results from the decomposition of the body, and in certain instances will give origin in others to the same disease which proved fatal to the subject.

A WONDER OF INTRIGUE.

In the year 1771, an extraordinary case was tried in the Court of King's Bench, Guildhall, by Lord Chief Justice Mansfield. The question was, whether a distinguished person, known as the Chevalier d'Eon, at one time ambassador from the Court of France to that of England, was a man or a woman. The case was brought into court in consequence of certain heavy bets that had been made as to the point at issue. A great deal of evidence was given. Lord Mansfield, one of our most acute judges, summed up carefully, and the jury, without hesitation, found for the plaintiff, thereby solemnly recording their belief that D'Eon was a woman. Nevertheless, in 1810, when the chevalier died, at the advanced age of eighty-two, it was proved that he was a man. At any time between those two dates, and for some years previous to the earlier one, public opinion was divided on this strange problem, though latterly the verdict of the jury had been received as a sufficient settlement of the question. How the mystification originated, and why it was carried on, will appear from the following account of D'Eon's career.

Charles Geneviève Louis Auguste Andre Timothee d'Eon de Beaumont was born in 1728, at Tonnerre, in the Province of Burgundy. The family is enrolled in the genealogical books of France as an ancient and illustrious one. His father and grandfather were both intendants of their municipality, and his mother, Francoise de Charenton, was the daughter of M. de Charenton, commissary of the French armies in France and Italy. It may be said, under these circumstances, that Charles d'Eon was born to good fortune. He was educated in conformity with his prospects, and took his degrees as doctor of civil and of canon law, became advocate of the Parliament of Paris, and was appointed Censor of Belles Lettres and History. He was besides an extraordinary adept in riding and fencing.

While engaged in all these employments and studies, and also making a name in literature by his occasional publications, D' Eon became known to the Prince of Conti, and was introduced by him to the Court of Louis XV. At that time, 1755, the king was anxious to reconcile the Court of St. Petersburg to his policy, and secure its alliance in the war against Prussia. In order to negotiate with success, secrecy and easy access to the sovereign of Russia were essential. How it was brought about, and what strange circumstances had preceded the daring attempt we know not, but D'Eon, disguised as a woman, went to St. Petersburg as reader of the French language, and secretary to the wife of the great Chancellor Woronzoff, who had married a Russian princess nearly related to the Empress Elizabeth. The intrigue succeeded so well that he was sent again the following year in his proper character as a man, in conjunction with the Chevalier Douglas, and with an avowed diplomatic mission. As a consequence of these negotiations, Elizabeth joined the armies of France and Austria with eighty thousand men, who were to have taken the field in aid of the King of Prussia. D'Eon, returning to Paris, was dispatched to Vienna to communicate the plan of operations agreed upon by Russia, and the famous battle of Prague was fought while he was in that capital. He hastened with the news of victory to Paris, and the king rewarded him with a commission as lieutenant of dragoons.

In 1759, after a third visit to the Court of Russia, D'Eon joined his regiment in Germany, with the rank of captain, and with an appointment as aide-de-camp to the Count and Marshal de Broglio. In the engagement at Ultrop he was twice wounded; and at the siege of Ostervitch, with only fourscore dragoons, and forty hussars, he completely routed a Prussian battalion, and took the commanding officer prisoner. In 1762 he was on the point of going as ambassador to Russia, when the death of Peter III. changed the relations between the two courts. So great, however, was the king's confidence in D'Eon, that he was sent to London, in September of the same year, as secretary of embassy to the Duke de Nivernois. The circumstances which followed proved the wisdom of this appointment; for it is doubtful if the Peace of 1763 would have been ratified if D'Eon, by his address, had not rescued the minister from the very serious dilemma in which his dishonorable conduct had placed him. On the duke's return to Paris, he showed his sense of the value of D'Eon's services, by procuring for him the appointment of Minister Plenipotentiary to the Court of Great Britain. Somewhat later, the king also granted him a handsome pension.

About the time of the first election which took place after the Peace of 1763, doubts began to be circulated about the sex of the Chevalier d'Eon. From that period to 1771, when the trial took place to which we have alluded, there was much speculation afloat on this subject, both in the press and in society. One day the Chevalier was found mysteriously wanting, and it had been given out by himself that a conspiracy existed against him. His name was continually before the public in some enigmatical shape. The rage for betting on the question, whether he was a man or a woman, took possession of the public; and after six years of ridiculous anxiety on this point, Mr. Hayes, a surgeon in Leicester Fields, brought an action against one Jacques, a broker and underwriter, to recover the sum of £700. The plaintiff alleged that Mr. Jacques had received premiums of fifteen guineas per cent., for every one of which he stood engaged to return one hundred guineas whenever it should be proved that the Chevalier d'Eon was a woman. This proof, Mr. Hayes contended, he now possessed; and, after a good deal of hard swearing, he gained his cause. Other sums, to an immense amount, depended on this suit; and we now know that the witnesses who decided it were perjured.

It cannot fail to strike the reader that D'Eon himself had it in his power to settle the dispute at once; but he remained in the background, allowed the secondary evidence full power, and otherwise acted in an equivocal manner. All this is easy to understand on the hypothesis that he was interested in the bets and policies; but this he absolutely denied in writing, and owing to his denial, the winners of the cause never touched a farthing of the money. The reason of this would require a legal explanation which it is not necessary to enter upon.

From the period of this extraordinary trial to the end of his life, D'Eon was placed in a more equivocal position than ever by the action of the French Court. Affecting to believe that he was really a woman, that Government continued his pension on condition of his wearing the apparel becoming to his sex. The reader may imagine the daily awkwardness of this to a man of the highest accomplishments, moving in the best society.

Before the French Revolution broke out, the Chevalier d'Eon lived for several years in obscurity with Lord Ferrers at Staunton Harold, and allowed the world to believe that he was a woman. Sometimes he would exhibit his skill in fencing, and on one memorable occasion he engaged in a match with the celebrated Chevalier de Saint George, before the Prince of Wales, at Carlton House. The destruction of monarchy in France and other occurrences had deprived him of his sole means of support in old age, and the English papers of 1791 and subsequent years contain advertisements of his exhibitions of fencing. These entertainments seem to have been very attractive, as the chevalier retained the costume to which he had so long been accustomed. Sometimes, indeed, he came out in character, as at Ranelagh and the King's Theatre, when he appeared upon the stage dressed in armor, with a casque and feather, representing Minerva, or the Maid of Orleans. In spite of his exertions in this way, old age and distress overtook him, and he died, after having been bedridden for two years. Without a doubt the career of the Chevalier d'Eon is one of the strangest on record. That a man learned, elegant and polite; a soldier, a statesman, an ambassador; in fine, a man of superior accomplishments, should have passed one-half of his life in the character proper to him, and lingered away the other half in that of an obscure and neglected old woman, is a case, perhaps, without a parallel.

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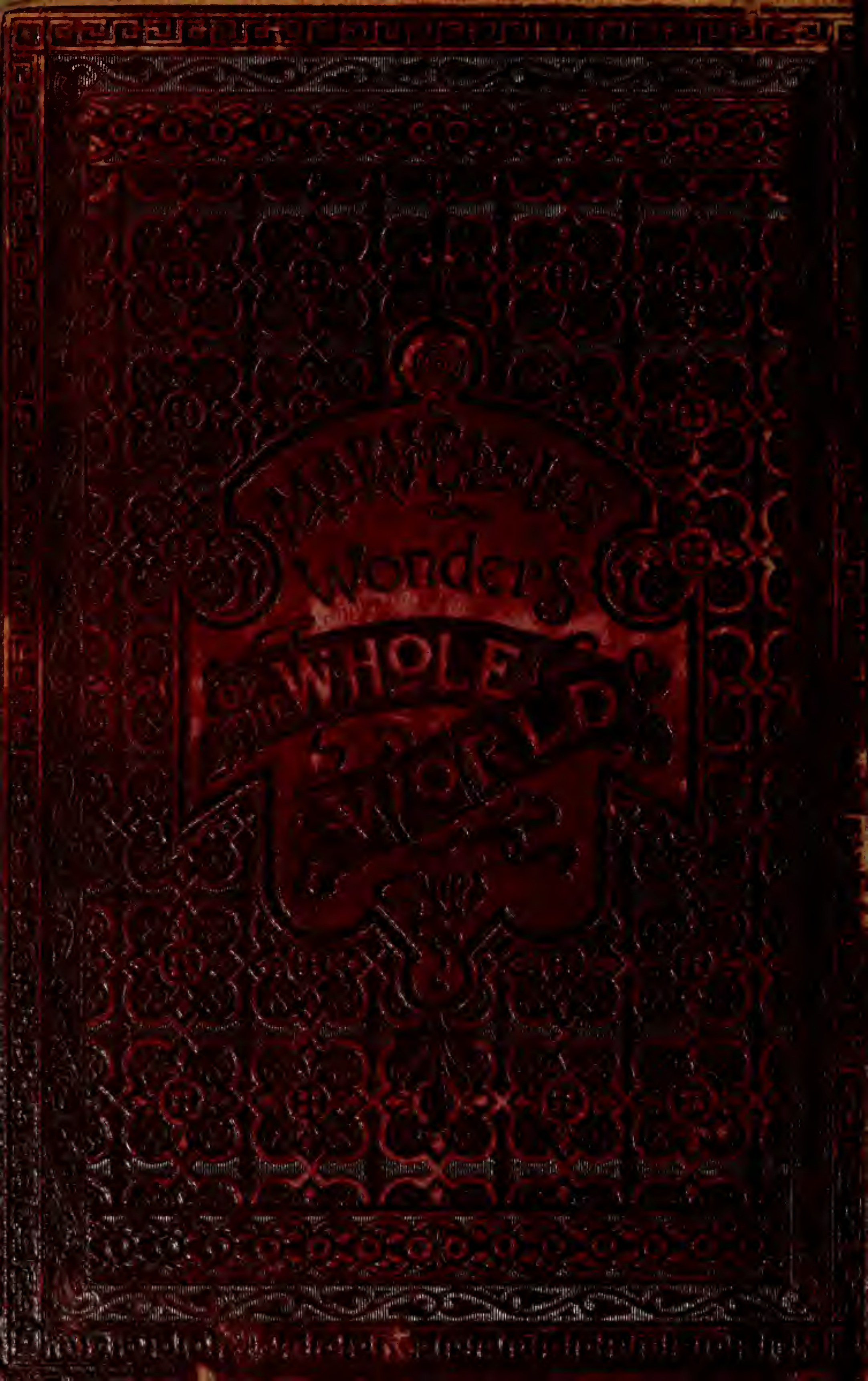
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